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Report on Technical Assistance to the City of Pascagoula, Mississippi

CSI Resource Systems, Inc.
Boston, MA

Prepared for

Environmental Protection Agency
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Initial technical assistance focused on an assessment of the feasibility of the City's proposed energy recovery project, a 100 TPD steam producing recovery system. To this end, on July 3, 1979, the City of Pascagoula submitted an application for financial assistance through the U.S. Commerce Department's Costal Energy Impact Program. This document contains a chronology of all significant activities toward resource recovery implementation; however, this report suggests an increased system capacity from 100 TPD to 150 TPD. Such an analysis was submitted to the City October 1979 and based the increased project costs on the need for a larger increased capacity along with the impact of inflation and a one year's delay in construction and start-up as a more practical time-frame.

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A TECHNICAL ASSISTANCE PROGRAM REPORT

REPORT ON TECHNICAL ASSISTANCE TO THE CITY OF PASCAGOULA, MISSISSIPPI

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Technical assistance by personnel teams. 42 USC 6913

RESOURCE RECOVERY AND CONSERVATION PANELS

SEC. 2003. The Administrator shall provide teams of personnel, including Federal, State, and local employees or contractors (hereinafter referred to as "Resource Conservation and Recovery Panels") to provide States and local governments upon request with technical assistance on solid waste management, resource recovery, and resource conservation. Such teams shall include technical, marketing, financial, and institutional specialists, and the services of such teams shall be provided without charge to States or local governments.

This report has been reviewed by the Project Officer, EPA, and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Project Officer: Elmer G. Cleveland

U.S. ENVIRONMENTAL PROTECTION AGENCY

TECHNICAL ASSISTANCE PROGRAM REPORT SERIES

REPORT ON TECHNICAL ASSISTANCE TO THE CITY OF PASCAGOULA, MISSISSIPPI

PREPARED FOR

OFFICE OF SOLID WASTE MANAGEMENT

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV, ATLANTA, GEORGIA

BY

CSI RESOURCE SYSTEMS, INC.

JUNE 1980

PREFACE

This report was prepared for the city of Pascagoula, Mississippi, under the Technical Assistance Program to state and local governments of the U.S. Environmental Protection Agency (EPA), as a result of a request to EPA Region IV by the city of Pascagoula. The report provides an overview of the project, a synopsis of the major analytic work conducted in the project, and copies of analytic reports and other documents prepared by CSI Resource Systems, Inc. (Resource Systems), a technical assistance contractor to the Office of Solid and Hazardous Waste, EPA Region IV. These reports are based in part on site visits and interviews with individuals involved in the city's energy recovery project. Under the terms of the Technical Assistance Program, all of Resource Systems' technical assistance activities on behalf of Pascagoula were paid for by EPA.

Resource Systems wishes to thank the following individuals for their support and generous cooperation:

- Mr. Charles Fulghum, City Manager of Pascagoula
- Ms. Linda Rosa, Grants Coordinator, City of Pascagoula
- Mr. Melvin Mitchell, Esquire, City Attorney
- Mr. Lloyd Compton, Consulting Engineer to the city.

Also contributing information to this report were:

- Mr. Lloyd Roberts, Mayor of Moss Point
- Mr. Harold Vaughan, Transfer Operator, Moss Point
- The Quaker Oats Company
- Thikol Corporation
- BFI.

OVERVIEW

From April 1979 through February 1980, EPA's Technical Assistance Program has extended support to the city of Pascagoula, Mississippi, in its efforts to develop an energy recovery project. Specifically, EPA has provided to Pascagoula the services of Resource Systems, its technical assistance contractor for Region IV.

EPA's technical assistance to Pascagoula focused on an assessment of whether an economically attractive and technically feasible project could be implemented. This assistance included:

- An assessment of whether the energy markets identified are technically compatible with demonstrated small-scale energy recovery technologies and represent economically attractive project opportunities.
- An analysis of the impact of alternative steam pricing strategies on project tip fees.
- An analysis of the quantity of waste potentially available to the project and possible waste acquisition strategies to ensure that a minimum economic tonnage would be available to the project.
- A preliminary assessment of project capital costs and plant sizing options, and an evaluation of project economics in comparison to landfill disposal.
- The development of public information materials in support of the city's bond referendum.
- A review of the requirements for project implementation, beginning with procurement.

This project has benefited from both the creative leadership of Pascagoula city officials and the strong technical support of the city's consulting engineer. The commitment of the city has been the single most important contribution to the project's present promising stage of development. The city and its consulting engineer first identified a 100-ton per day (TPD) energy recovery project as a possible solution to the city's solid waste disposal problems in a prefeasibility study, which was part of its application to EPA for technical assistance. While the city sought EPA's assistance,

it began to prepare an application for project financing assistance under the Coastal Energy Impact Program (CEIP) administered by the Department of Commerce. In the intervening months, the city has steadily pursued development of the project, responding creatively and aggressively to the problems that inevitably arise in project implementation.

During the past year, the city has kept project planning on course by successfully:

- Obtaining a 6-percent, 30-year, $6 million loan financing commitment for the project from CEIP. (Pascagoula is the only city that has used CEIP funding for this purpose.)
- Pursuing a regional approach and soliciting the cooperation of the city of Moss Point and Jackson County in making waste available to the project.
- Responding to an initial plant siting problem by developing an alternative market in the city of Moss Point. This market is interested in participating in the project, is economically and technically attractive, and presents minimal siting programs.
- Organizing a public education program to obtain voter approval of the authorization to finance the project and obtaining an 86-percent voter plurality in favor of the project in a bond referendum.

EPA was responsive to the city's need for assistance in accomplishing these tasks and in resolving other issues at various points in the city's planning process. As a result, several written products were prepared, rather than a single report. These products are presented as exhibits in an appendix to this report.

The remainder of this report provides descriptions of the major technical assistance activities and synopses of the written products prepared. These activities and products include:

- A project feasibility report (Exhibit 1)
- "A Review of the Proposed Contract for Private Residential Collection Services" (Exhibit 2)

- "Revisions in the City's Application for Assistance under CEIP" (Exhibit 3)
- A site visit to Salem, Virginia
- Materials in support of the city's public education program (Exhibit 4)
- A presentation of the project implementation plan (Exhibit 5).

PROJECT FEASIBILITY REPORT

The initial technical assistance effort focused on an assessment of the feasibility of the city's proposed energy recovery project. In this effort, Resource Systems reviewed earlier, prefeasibility work on the project by the city and its consulting engineer and gathered and evaluated data on the waste supply potentially available to the project; the potential markets for steam from a small-scale recovery system; and possible strategies for pricing steam sold to these markets; and the economics of resource recovery in comparison to landfill disposal.

Data gathering and analysis began in August 1979 and was completed in September 1979. The report was submitted and reviewed with the City Manager and City Council on October 1, 1979. The report confirmed that a local pet food processing industry offered the most attractive market in Pascagoula for steam generated by a small-scale, 150-TPD energy recovery system. The potential steam purchaser uses natural gas to produce low-pressure steam (100 psig) for a relatively constant load, two shifts per day, 5 days per week. The potential user's energy demand is sufficient to utilize all the steam that could be recovered from the waste available.

The report concluded that an energy recovery project appears to be an economically attractive alternative to landfill disposal costs (approximately $14 per ton), because it is surrounded by wetlands and a coastal flood plain. The city has no nearby landfill sites and thus incurs substantial costs for hauling waste to environmentally acceptable disposal sites.

The report identified several issues that the city would need to address as it proceeded with the project:

Waste Availability. Waste generation in Pascagoula was found to be significantly less than 100 TPD. The city was encouraged to initiate discussions with the city of Moss Point to obtain its waste supply for the project, as this additional waste would make the project more economically attractive to the city.

Waste Control. The city cannot ensure that commercial waste collected privately within its boundaries would be delivered to an energy recovery facility. This problem could be rectified by modifying the terms of the city's contract with its commercial collector and giving the city a clear legal right to direct such wastes to the area of ultimate disposal.

Plant Sizing. In its prefeasibility analysis, the city developed preliminary cost estimates for a 100-TPD system. An analysis of peak and average waste generation values, plant availability, and the impact on steam revenue of different waste throughputs concluded that, for preliminary sizing purposes, the plant should have a design capacity of 150 TPD, with three 50-TPD modules.

Product Pricing. Two steam pricing scenarios were evaluated, considering different escalation rates for the price of natural gas and different discount rates to the potential buyer. This analysis bracketed the range of steam prices that would yield tip fees which would be economically attractive to the city of Moss Point while stabilizing Pascagoula's net disposal cost.

REVIEW OF PROPOSED CONTRACT FOR PRIVATE RESIDENTIAL COLLECTION SERVICES

Pascagoula provides municipal collection of residential wastes. The city contracts for collection of commercial wastes and bills

commercial businesses directly for the cost of this service. As it planned an energy recovery project, the city opened discussions with private haulers about contracting for private residential collection. When a contract was proposed, the city asked EPA for assistance in reviewing the proposed terms, particularly with respect to the compatibility of the contract with the development and operation of an energy recovery project. Several changes were recommended in the proposed draft contract, including:

- Clear stipulation of the city's ownership of the waste stream and its right to direct waste collected by the contractor to disposal at an energy recovery facility.
- More precise definition of the remedies available to the city in the event of the contractor's inability to perform because of force majeure or other reasons.
- A provision that the city could adjust the contract price to reflect the savings realized by the contractor in haul and disposal costs if the city established an energy recovery facility.
- An approach to recognizing the impact of inflation on the operator's costs that would more accurately reflect real increases in operating costs and be more advantageous to the city than the approach originally proposed.

REVISIONS IN THE CITY'S APPROACH FOR ASSISTANCE UNDER CEIP

Before receiving the EPA report on project feasibility, Pascagoula prepared and submitted an application for assistance to the Department of Commerce under CEIP. Upon reviewing the EPA report, the city determined that several elements of the project costs estimated for its CEIP application should be revised upward. The city requested an analysis of these cost increases that would justify a revision in the city's loan request to CEIP. Such an analysis was submitted to the city on October 4, 1979. This document reviewed the basis for increasing project costs to account for larger system capacity

and for the impact of inflation on project costs arising from an additional year's delay in completion of construction, startup, and acceptance.

This document proposed that system capacity be increased from 100 to 150 TPD. The impact of this increase on capital costs and on steam revenues was evaluated. The analysis showed that the net disposal cost to the city would be lower with a 150-TPD system.

The report argued for an additional 1-year allowance in estimating the inflation of project capital costs, because the city was seeking a project financing commitment much earlier in the project than it would have if conventional rather than CEIP financing were to be used. Because of this early commitment, it is prudent to allow for delays in implementation which might be unavoidable, because the city must conduct negotiations with a number of outside parties before undertaking construction. The economic impact of the additional allowance for inflation in project costs was evaluated, and it was found that the net disposal costs to the city would remain very attractive.

SITE VISIT TO SALEM, VIRGINIA

The city anticipated that, if its CEIP application were approved, voter approval of a bond referendum would be necessary in order for the city to acept the loan offer. In preparing for this referendum, the city officials decided to obtain first-hand knowledge of the operation of an energy recovery facility. Under the EPA peer match program, the city received assistance and contributed its own funds to support a trip to a small-scale energy recovery facility operating in Salem, Virginia, by the city manager, two city councilors, the city's consulting engineer, and grants coordinator, a member of the local press, and a representative of the potential energy market. The visit included discussions with key local officials in Salem on the detailed economics of the project, system performance, and any negative impacts of the plant on the environment. The visit strengthened the belief of city officials that energy recovery is a sound long-term approach to solving their disposal problems. The

city was also satisfied that a project could be implemented without significant negative impacts on its immediate environment. As a result of the visit, the city began to develop a public education program to prepare for the voter referendum on the bond issue.

PUBLIC EDUCATION PROGRAM

In anticipation of a voter referendum, the city prepared a public education program on the project. The focal point of this program was a Citizen's Advisory Committee made up of local community and business leaders. The committee's program had three primary components:

- Dissemination of written material describing the purpose and impact of the project to every household.
- Presentations on the project to every community group in the city through a speaker's program, using a slide show developed by city staff.
- Presentation of personal endorsements of the project by community leaders on radio and in the press immediately prior to the referendum.

Technical assistance support for these activities included preparation of descriptive materials on the project, radio announcements, and presentation outlines.

The referendum was originally scheduled for mid-January 1980 but, because of an unexpected controversy over the proposed site of the facility, it was delayed until May 13, 1980. The outcome of the May referendum was an 86-percent plurality in favor of the project.

PROJECT IMPLEMENTATION PLAN

Expecting both approval of the CEIP loan and an affirmative response from the voters, the city began to focus on the requirements for project implementation, from procurement through

construction and startup. The city requested and obtained assistance from EPA in developing a preliminary implementation plant, including an identification of the major tasks in the procurement process, the estimated time to accomplish these tasks, and the types of skills required to carry out the plan.

CHRONOLOGY OF ACTIVITY

February 1979	City requests technical assistance from EPA Region IV.
April 11, 1979	EPA, with its contractor CSI Resource Systems, visit Pascagoula to assess technical assistance needs.
July 3, 1979	City submits initial application for CEIP assistance.
July 30, 1979	Technical assistance begins with data-gathering interviews in Pascagoula.
August 17, 1979	The city receives a review of its proposed contract to convert to privately contracted residential collection.
October 1, 1979	EPA reviews with city officials the report on project feasibility.
October 4, 1979	Documentation is completed supporting increases in city's loan request to CEIP.
October 25, 1979	The city visits modular steam generating plant in Salem, Virginia, on an EPA peer match program.
November 15, 1979	The city receives Department of Commerce approval of revised CEIP loan.
December 11, 1979	Material for public information program on bond referendum is delivered.
January 15, 1980	City Council postpones bond referendum in attempt to resolve siting problems with energy recovery facility.

February 13, 1980	EPA meets with the city to evaluate alternative energy market, discuss plant siting issues, and review overall requirements for project implementation.
February 20, 1980	The city obtains bond counsel's opinion that the issue of building a municipally owned facility within the boundaries of another city will require a friendly suit to resolve.
March 3, 1980	The city obtains letter of interest from alternative energy market.
April 13, 1980	City Council reschedules voter referendum on project stipulating that facility will be located in the city of Moss Point.
May 13, 1980	Voters approve borrowing authorization by 6 to 1 margin.

EXHIBIT 1

REPORT

TO

THE CITY OF PASCAGOULA

ON ITS

RESOURCE RECOVERY PROJECT

OCTOBER 1, 1979

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INTRODUCTION

At the request of the City of Pascagoula, the U.S. EPA Region IV through its Technical Assistance Panels Program has assigned CSI Resource Systems to assist Pascagoula in planning the implementation of its resource recovery project. We are advising Pascagoula on several of the issues which bear upon the overall feasibility of the project.

The scope of our work includes:

- Suggesting economic and contractual principles as guidance to the City's negotiations with a prospective buyer of energy from the resource recovery plant.
- Estimating the supply of waste both available and required by the project and the terms under which the portion of the required waste stream not within the City's direct control should be secured.
- Identifying a procurement strategy which is consistent with both the City's attitude towards risk exposure and the legal and institutional environment.
- Analyzing of preliminary project economics to assess the competitive position of the project vis a vis the landfill disposal option.

This report summarizes the results of our analyses and the findings we have made in each of the above areas.

Resource Recovery: Some Overview Observations

We would like to begin by offering some observations about our approach to resource recovery.

Resource Recovery as a Business...Implementing a resource recovery project is similar to starting a new business venture.

- Manufacturing technology uses a feedstock to produce a product meeting a buyer's specification.
- Carefully structured contractual relationships assure the availability of the proper amount of feedstock, the sale of the product and a source of financing.

- Sources of revenues must cover capital and operating cost and provide long-term assurance that plant investment can be amortized over a period of 20 years or longer.

- Competitive constraints must be considered in producing a fuel substitute for sale and in disposing of wastes at costs comparable to the alternative of landfill disposal.

- Sources of risk to the integrity of the business venture must be identified (e.g., change in composition or volume of the feedstock, loss of market for product, performance failure in the manufacturing technology) and strategies devised for protecting against these risks.

- The sponsor of the business must choose a business development strategy which can be either the direct assumption by the sponsor of the responsibility and consequent risk of procuring the services and equipment to design, construct and operate the manufacturing plant or securing the cooperation of a partner who is willing and able to assume these responsibilities.

Status of Pascagoula's Efforts

At this stage of its implementation process, the City has investigated whether the four key ingredients which are prerequisites for a resource recovery plant are present in Pascagoula.

These are:

- Existence of interested buyers whose energy consumption patterns and costs of fossil fuel would result in utilization of a sufficient quantity of solid waste and generate a reasonable revenue stream that would justify a decision to invest in an energy recovery system.

- Existence of a proven technology capable of reliably meeting day-in and day-out the energy requirements of identified viable potential buyers and is capable of reliably processing the available solid waste.

- A reliable supply of solid waste sufficient to meet a significant proportion of the energy required by potential buyers.

- The existence of suitable vacant sites within reasonable transport distance of potential energy buyers which could be made available for a recovery facility.

The City has made very significant progress in determining the following:

- Identifying Quaker Oats Company as the primary market opportunity and the Wastewater Treatment Plant as the secondary market opportunity.
- Determining that a modular starved air combustion system with heat recovery to produce low-pressure, low-temperature steam is the preferred technology.
- Estimating the volume of the waste stream within economic distance of the project.
- Locating plant site.

In addition to the above, the City has an accomplishment to point to that is unique in our experience with resource recovery projects, and which can have a very favorable impact on the economics of this venture At a very early stage in implementation it has secured assistance from the Coastal Energy Impact Program as a source of financing at a very attractive cost and with substantial flexibility.

Report on Resource Systems' Efforts to Date

Our work elaborates on the progress the City has made with more detailed analyses of three factors: the waste stream, market and project economics. Our findings are organized around each of the above topics. They support the general conclusion that resource recovery should be an attractive economic alternative for the City of Pascagoula. It is important to note that this is a preliminary judgment contingent on the future resolution of contractual issues among participants in the project and on the accomplishment by the City over the next two years of a demanding project implementation process. The latter sections of our report highlight some of the issues the City will need to address in the next stage of implementation.

WASTE STREAM ANALYSIS

Our investigation here has focused on three points:

- Assessing the quantity of waste available.
- Outlining a strategy for assuring that the amount of waste required by the project can be delivered to a resource recovery facility.
- Determining whether the waste required is likely to be obtained at an economic price.

The following table displays our interpretation of the data on waste quantity made available to us by Pascagoula, BFI and Moss Point:

WASTE STREAM ANALYSIS[1]

Source	Controlled by	Average Available Tonnage[2]	
		Annual	Daily
Pascagoula:			
Residential Collection	City of Pascagoula	7,636	30.3
Commercial Collection	BFI[3]	11,718	46.5
Moss Point	Moss Point Station Operator[4]	8,366	33.2
	TOTALS:	27,720	110.0

1. The Technical Appendix presents detail on the sources of data and methods used in this analysis.
2. Based upon a five day week.
3. Although BFI technically owns the commercial waste it collects in Pascagoula, the City, through the mechanism of contract negotiation and renewal, has the ability to obtain control of this waste at a reasonable price and assure its delivery to a resource recovery plant.
4. Moss point has a contract with a Transfer Station Operator extending through 1983. The Transfer Operator has title to, and thus ultimate control of, this waste.

Findings

- Sufficient waste is available to the project to meet a substantial portion, approximately 75 percent, but not all of Quaker Oats steam requirements.

- Alternatively, the same waste stream could be used to satisfy 100 percent of the electricity requirements of the regional wastewater treatment plants.

- Obtaining Moss Point's waste is essential to structuring an economically attractive project with the Quaker Oats Co. In the absence of contractual agreements to the contrary, Mississippi law stipulates that once Moss Point delivers its waste to the transfer operator that waste in effect becomes his property. Therefore, the City must negotiate a mutually satisfactory long term arrangement with this party. In doing so, the City must deal with the fact that there can be no "guarantee" that the Transfer Station owner will be in business five years from now.

- The City does not now have adequate control over privately collected waste within Pascagoula. But it is in a strong position to obtain the necessary control through contractual negotiations with BFI. This same point also holds in the case of any arrangements the City may contemplate for private collection of both residential and commercial waste.

- Resource recovery can be compatible with any arrangemet the City may contemplate for private collection of its waste.

In terms of the issue of waste control, we have given the City a detailed review* of a draft model contract which the City is considering as the basis for combined commercial and residential collection by a private hauler.

In summary, we have advised the City that to assure its control over privately collected waste within Pascagoula and the delivery of this waste at an economic price to its resource recovery plant, the City should stipulate the following principles in any contracts it enters into with commercial collection services:

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* See Technical Appendix.

- The City maintains ultimate ownership of all wastes collected within its boundaries.
- The City retains the right to designate the site where the collector can ultimately dispose of wastes.
- On the opening of a resource recovery plant, the collector will deliver waste to the resource recovery facility at a "tip fee" not exceeding the cost previously incurred by the collector in hauling and disposing of wastes at a landfill.

The critical issue in negotiating for delivery of Moss Point's waste to the project will be the "tip fee" charged to the Transfer Station owner. He will seek a "tip fee" that is no greater than his alternative cost hauling and disposing of waste at landfill. The Project Economics section of this report analyzes the impact a tip fee set at this level.

MARKET ANALYSIS

Our investigation of possible markets for energy produced by a resource recovery plant considered the technical and economic feasibility of entering into a long-term agreement with the Quaker Oats Company for purchase of steam. Technical feasibility is principally a question of whether commercially demonstrated technology can meet the hour to hour, day to day steam requirements of Quaker Oats. Economic feasibility was evaluated in terms of the net disposal costs ("tip fee") that the City would incur under an agreement to sell steam to the Quaker Oats Company. We assume a project is economically feasible if the tip fee is competitive with the alternative cost of landfill disposal of solid waste. In addition to the economic issues involved in a purchase agreement with Quaker Oats, other important contractual terms are a necessary part of the buyer/producer relationship. Contract principles on these issues are presented. These

As an alternative to Quaker Oats Company as a buyer, the production and sale of electricity to the Wastewater Treatment Plant was considered.

Findings

- Pascagoula and Moss Point generate insufficient tonnage of solid waste to permit meeting Quaker Oats steam requirements on the basis of 100 percent availability. Although purchasing all of their steam from a resource recovery plant would enable Quaker Oats to avoid some of the operating and maintenance costs in addition to fuel costs they incur in producing their own steam, these "savings" are too small to offset the costs of installing and operating package boilers at the resource recovery plant.

- Given an average volume of 110 tons of processible waste, Quaker Oats can be supplied with a significant amount of their daily steam requirements (approximately 75 percent). It appears likely that a steam purchase agreement can be negotiated with Quaker which results in an economically attractive net waste disposal cost for the City.

With respect to technical feasibility, Quaker Oats appears to be

an attractive steam market. Its requirements are 100 psig, saturated steam with a reasonably stable load curve averaging 24,000 lbs for 16 hours per day, and 12,000 lbs for 8 hours per day.

Finding

- Small scale resource recovery systems using a starved air combustion with heat recovery technology have performed well in meeting comparable requirements in other commercial settings.

- Although we have not evaluated system performance in terms of meeting air quality requirements. This type of system has been operated in compliance with air quality regulations at least as rigorous as those existing in Mississippi.

The key issue in negotiating an agreement with Quaker Oats is their cost for buying steam. The negotiating posture of Quaker Oats will be motivated by a desire to achive the lowest possible fuel costs to improve the "competitive" position of its plant. On its side, the City must weigh two possible negotiating positions. It may seek an arrangement that maximizes the energy revenue to the project and thus minimizes its disposal cost, or it may seek a stable long term disposal cost which is competitive with its best available current alternative.

The critical reference point in negotiating the price of steam with Quaker Oats is their own cost of producing that steam directly. Where gas is the fuel, this cost has three components: the pipeline supplier's price of gas, the distribution charges added by the City, and the Quaker Oats cost of producing steam exclusive of fuel costs. This latter cost category is comprised of chemicals for water treatment, labor associated with boiler operations, maintenance costs for boilers, and depreciation charges. Because there is insufficient waste to produce 100 percent of of Quaker Oats steam requirements, Quaker Oats will continue to incur a substantial portion of the non-fuel costs to produce the balance of steam required. Because steam is critical to their production process, it is also likely that, in the early years of operation, Quaker Oats may insist on maintaining their boilers on standby (warm) on a 24-hour basis until the reliability of the energy facility has been reasonably demonstrated. Under these assumptions, the only significant costs which

Quaker Oats avoids in purchasing steam from the resource recovery facility are pipeline fuel charges and the City's distribution charges. In negotiating a price for steam, it is in the City's interest to make it attractive for Quaker Oats to purchase all of the steam that the plant can produce. The price must therefore recognize a discount on what it would otherwise cost Quaker Oats to produce this steam using gas. A simple formula for pricing steam to Quaker Oats can be stated as follows:

$$\text{STEAM PRICE } (\$/\text{M lbs}) = \text{GAS COST } (\$/\text{MCF}) \times \text{Discount} \times \left(\frac{1400 \text{ CF GAS}}{1000 \text{ lbs steam}}\right)^{*}$$

However, the steam purchase agreement must also resolve the issue of how much of the escalation that can be expected in the price of gas in future years should be reflected in increases in the price of steam over this period. In choosing between some maximum or minimum amount of escalation, the City must resolve to what extent its objective in participating in a resource recovery project is to maximize revenue from energy production as opposed to a primary motive of stablizing its cost of waste disposal, i.e., the project "tip fee."

The revenue maximizing approach implies a negotiating strategy that seeks to pass through to the buyer the full amount of escalation in the price of gas.

The "tip fee" stabilization approach implies (where project economics permit) a willingness to pass through something less than full escalation in gas prices to the buyer, provided that the tip fee remains relatively stable during the life of the project and is always superior to the alternative cost the City would have to pay for landfill disposal.

Finding

- We have evaluated the economics of the project on the basis of several alternative steam prices which satisfy both the constraint of providing Quaker Oats with

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* Quantity of gas required to produce 1000 lbs of 100 psig, saturated steam.

steam at a competitive discount from the cost of gas and of meeting the City's assumed criteria of either revenue maximization or tip fee stabilization. The analysis presented in the subsequent section indicates the project is economically feasible.

In addition to these economic issues, another major issue to be addressed in contractual arrangements with the energy buyer is risk. For example, it is possible that a buyer may not be able or willing to purchase the volume of steam originally anticipated. Should this occur, the consequences on project economics would be quite serious, since Pascagoula would be faced with a major loss of revenue needed to cover the continued costs of disposal and debt service. There are a number of contractual terms which offer some protection against these consequences, such as:

- A minimum contract period which is coterminous with the period of years required to amortize the plant's capital cost.
- Commitment to accept and/or pay ("take or pay") for all steam produced at a certain minimum rate expressed in pounds per hour for 252 days per year.
- A definition of default by the purchaser which covers the following conditions: bankruptcy, plant relocation or closing, a change in process which significantly reduces the buyer's requirements for purchased steam and a temporary plant shut down which is within the control of the buyer (i.e., not due to an Act of God or other factors beyond the control of the operator).
- A default penalty which compensates the project for loss of revenues over a specified period and for the costs that may be incurred in relocating or modifying the plant to service the requirements of another buyer.
- A definition of force majeure conditions, i.e., conditions beyond the reasonable control of either party which relieve that party of its performance obligations under the contract.
- A signatory to the contract at a corporate level that gives reasonable assurance of performance.

In addition to the purchase of steam by the Quaker Oats Company, we considered the alternative of producing electricity for the proposed regional waste water treatment plant. Although the proposed plan has been approved in principle by the EPA, analysis of this alternative faces major unknowns. The facility is not yet underway, the final design has not yet been chosen, nor has the responsible managing entity for a plant been organized; and we have therefore had to make major assumptions with respect to the plant's energy requirements and the price likely to be paid for the purchase of electricity.

Given these reservations, we find that:

- It appears possible to produce electricity in excess of 100 percent of the expanded plant's requirements, using low pressure, low efficiency turbo generators.

- Although the technology of low pressure electricity generation is well demonstrated in industrial settings, there is little operating experience in this generating mode using steam from a resource recovery plant. The critical operating issue in this case is the ability to control the steam load on the turbine given the variability in the heat content of the solid waste fuel. Thus, electricity production represents a greater technical risk than does straight steam production at a relatively low temperature and pressure.

- In purchasing electricity from a resource recovery project, the waste water treatment plant operator must evaluate its power reliability requirements given the consequences of an outage. Where plant reliability requirements are high, it may be necessary to arrange for backup power supply through interconnection with the utility grid, rather than be reliant on the resource recovery plant as the sole source of power supply. This would entail purchase of backup power from Mississippi Power at a cost equal to their prevailing kilowatt demand charge. This cost which the waste water plant pays to Mississippi Power would have to be offset by a discount on the price of electricity it buys from the resource recovery plant.

- The price at which the resource recovery plant sells electricity must be competitive with the alternative price charged by Mississippi Power for electric power. This competitive constraint, combined with the low

efficiency of electricity production (a heat rate of 20 lbs of steam per kilowatt hour) indicates that less revenue will be realized per unit of steam from the sale of electicity than from the sale of steam to Quaker Oats. There is the additional problem of selling the surplus electricity that will be produced. Although sale through grid interconnection wth Mississippi Power is technically feasible, the price that Mississippi Power would pay is likely to reflect a very substantial discount from their retail KWH rates.

- In summary, the waste water treatment plant as an energy buyer poses the problems of a higher level of technical risk, lower energy revenues, higher capital and O&M costs in comparison with the sale of steam to the Quaker Oats Company.

ECONOMIC ANALYSIS

This section of the report addresses the critical issue of whether the City can achieve the appropriate balance of project revenues from tip fees and the sale of steam to Quaker Oats. Combined revenue from these sources must be sufficient to cover the annual debt service and operating costs of the plant. Revenues from tip fees are constrained by the need to set a tip fee low enough to assure that the Moss Point Transfer Operator will deliver waste to the facility. The constraint on steam revenues is the need to reflect some "discount" on the price of steam to Quaker Oats.

Working within these guidelines, the analysis of project economics involved the following steps:

- Previous capital and O&M cost estimates were reviewed and revised where appropriate.
- A theoretical estimate was made of the lowest possible cost at which solid waste could be landfilled.
- The cost of natural gas was projected through 1990.
- Project economics were evaluated using two different assumptions about the city's objectives in negotiating with Quaker Oats.

The City net disposal costs ("tip fee")were evaluated, assuming it negotiated to extract the highest possible price for steam from Quaker Oats. That is, given the assumption of rising gas prices, if steam were sold at the minimum discount to Quaker Oats, what would the City's tip fee be?

Alternatively, net disposal costs were calculated assuming that the City's primary objective was to realize a "tip fee" low enough to assure delivery of Moss Point's waste with any potential revenues above this minimum requirement conceded to Quaker Oats in the form of a discount on the price of steam.

This analysis serves several objectives. However, it is important to emphasize that our intent is not to recommend that the city must choose one of these alternatives as its negotiating objective with Quaker Oats. There are other motives and actors which will

influence the City's ultimate choice of negotiating strategy, and it is likely that the final outcome will be somewhere between these two extremes.

It is our purpose to use this analysis to emphasize the critical effect that the City's negotiations with Quaker Oats and the Moss Point transfer operator will have on project economics. The analysis also indicates the latitude that the city has in setting a steam price while still realizing acceptable project economics. It also provides the City with a basis for examining the reasonableness of the assumptions made and determining whether on this basis it finds resource recovery is economically attractive.

Table 2 identifies the important characteristics of the resource recovery system on which both analyses were performed.

TABLE 2*

Waste Received	= 27,720 tons per year
Waste Accepted	= 22,176
Waste Processed	= 21,730 TPY
System Design Capacity	= 150 tons per day
Daily Average Tons Received	= 110 TPD_5
Peak Value Tons Received	= 130 TPD_5
Annual Operating Days	= 252
Heat Value of Solid Waste	= 4,300 Btu/lb
System Efficiency	= 65% (2.35 lbs steam/lb MSW)
Annual Steam Production	= 102.35 x 10^6 lbs @ 100 psig
Capital Costs	= $5,125,000 (1982 dollars)
Financing Terms	= 30 yrs @ 5%
Annual Debt Service	= $333,700
Annual O&M	= $390,700 (1982)
Annual O&M escalation	= 7%
Start of Commercial Operation	= December 1982

*All values are for 1982.

Findings:

- Under the revenue maximizing approach, the initial year tip fee would be approximately $10.00 per ton and then would decline as a consequence of steam revenues escalating more rapidly than O&M costs.

- Assuming the tip fee stabilization approach, the analysis indicates an initial year tip fee in the $10 per ton range dropping to $7 per ton in subsequent years and remaining relatively stable thereafter.

Figures 1 and 2 illustrate the trends in both tipping fee and steam prices under each alternative. The numbers on the graphs should not be taken as the predicted value, but rather as approximations. The key underlying assumption is that the price of natural gas will escalate significantly during the next decade. This escalation results in higher steam prices and thus more revenue to the project. Resource recovery would appear to be the city's least expensive disposal alternative in the years ahead.

It is important to note a significant shortcoming of the graphic presentation. It assumes that the project involves only two parties, the City and the energy buyer, who negotiate the allocation of revenues between themselves. The Risks and Procurement section of the report emphasizes the important role that the system vendor/operator can play in the project. The City's decision on the role of the system vendor/operator may require that he also participate in revenue sharing. Thus, the graphic presentation should be seen as the projection of economic trends that are favorable, not as a prediction of actual disposal costs.

The graphs and the underlying assumptions are the basis for illustrating alternative pricing schedules for the sale of steam to Quaker Oats. As noted earlier, energy purchase agreements typically base the price of steam on the cost of the buyer's alternative fuel less some discount. Tables 3 and 4 indicate these relationships for both the revenue maximizing and tip fee stabilizing approaches. Again, these numbers should not be taken as recommended prices, but rather as illustrative of the consequences of two alternative negotiating strategies.

Fig. 1 - Projected Tip Fee

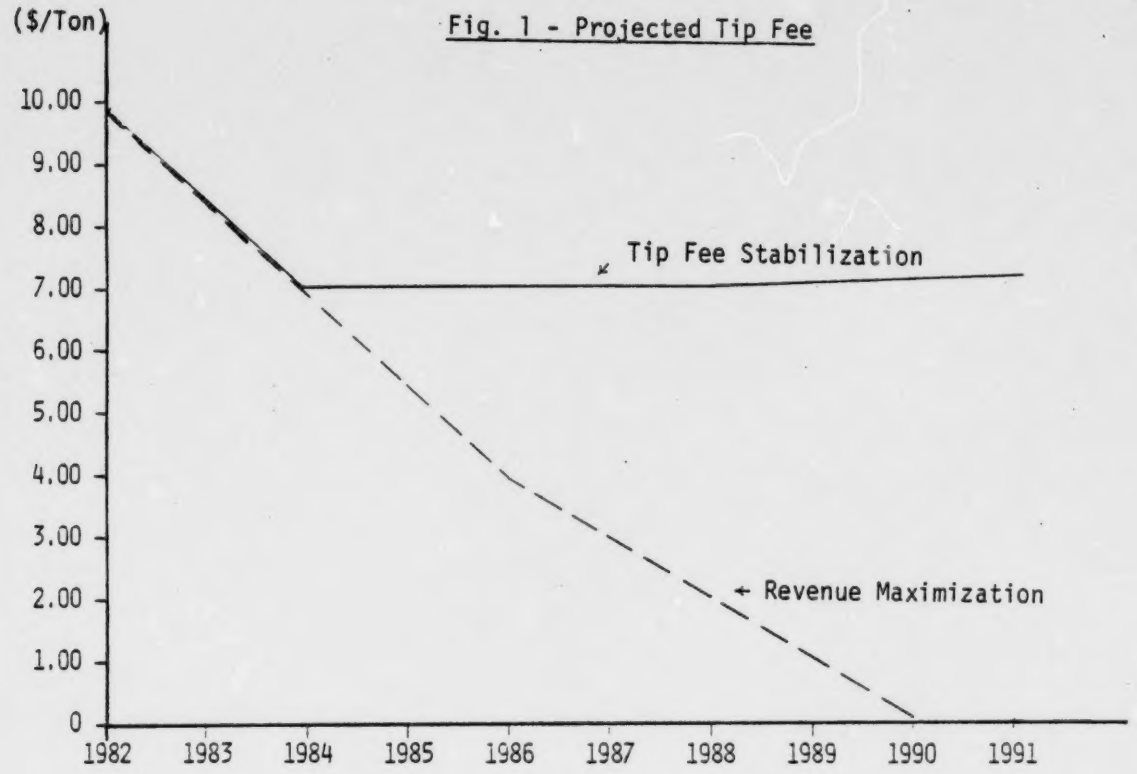

Fig. 2 - Projected Escalation in Steam Price

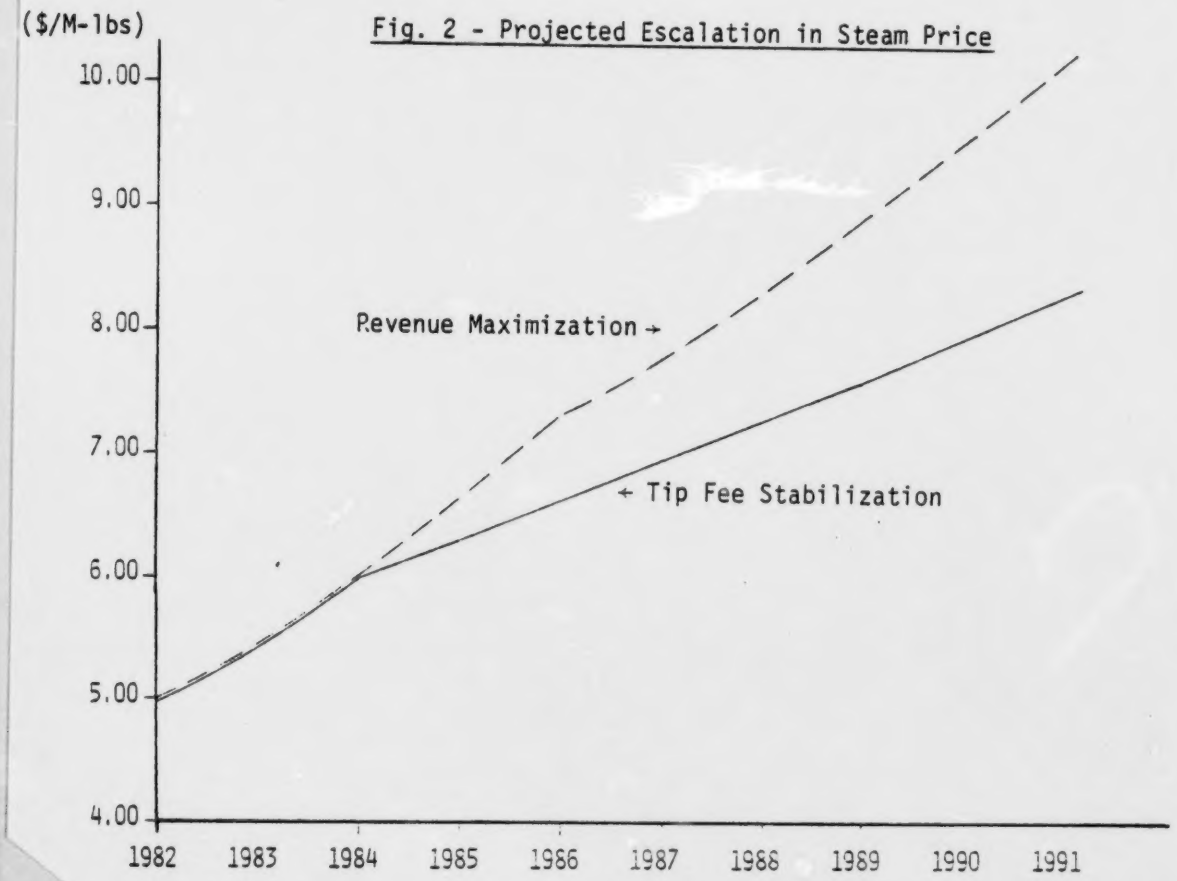

TABLE 3

REVENUE MAXIMIZING

Projected Gas Price ($/MCF)	Cost of Steam ($/1000 lbs)	Discount (%)	Discounted Cost of Steam ($/1000 lbs)
3.81-4.09	5.33-5.72	10	4.80-5.15
4.10-4.52	5.73-6.33	10	5.26-5.70
4.53-5.00	6.34-7.00	10	5.71-6.30
5.01-5.48	7.01-7.67	10	6.31-6.90
5.49-5.87	7.68-8.22	10	6.91-7.40
5.88-6.27	8.23-8.78	10	7.41-7.90
6.28-6.75	8.79-944	10	7.91-8.50
6.76-7.22	9.45-10.11	10	8.51-9.10
7.23-7.74	10.12-10.83	10	9.11-9.75
7.75-8.25	10.84-11.56	10	9.76-10.40

TABLE 4

TIP FEE STABILIZING

Projected Gas Price ($/MCF)	Cost of Steam ($/1000 lbs)	Discount (%)	Discounted Cost of Steam ($/1000 lbs)
3.81-4.09	5.33-5.72	10	4.80-5.15
4.10-4.52	5.73-6.33	10	5.16-5.70
4.53-5.00	6.34-7.00	10-13	5.71-6.10
5.01-5.48	7.01-7.67	13-16.5	6.11-6.40
5.49-5.87	7.68-8.22	16.5-18.5	6.41-6.70
5.88-6.27	8.23-8.78	18.5-20	6.71-7.00
6.28-6.75	8.79-9.44	20-23	7.01-7.30
6.76-7.22	9.45-10.11	23-25	7.31-7.60
7.23-7.74	10.12-10.83	25-26	7.61-8.00
7.75-8.25	10.84-11.56	26-27	8.01-8.40

Under the tip fee stabilization approach, the discount given to Quaker Oats increases significantly in future years, while the "tip fee" nevertheless remains the same. But in the initial years the "tip fee" does exceed the theoretical least-cost estimate for landfill disposal. Before the city makes a final decision on its pricing strategy, it must know the maximum "tip fee" that the Moss Point operator is willing to pay. If this figure is below the early year "tip fee" estimates for the project, then the City would be faced with two alternatives for balancing the economics of the project. It could negotiate a discount lower than 10% in the steam price for those initial years, or it could establish a "tip fee" differential, charging a lower fee for Moss Point waste and a higher fee for Pascagoula waste.

The following discussion provides more detail on the procedures and assumptions underlying key aspects of the economic analysis.

Capital and O&M Cost Estimates

Our analysis of system costs differs on several items from that presented in the City's CEIP application. Most significantly, we have set system capacity at 150 TPD_5. The available waste stream data indicate an average daily volume of 110 TPD_5, with a peak design point of 130 TPD_5 to handle surges in daily volume. The steam that can be produced from this waste is well within the limits of what Quaker Oats can absorb. It is desirable to have some redundancy in plant capacity to allow for periodic maintenance and unexpected outages. For all these reasons, system capacity should be greater than 100 TPD_5. We have proposed a configuration of three 50 TPD_5 units, although before making a final decision the City should compare this with the alternative of four 36 TPD_5 systems.

The 50 TPD of additional capacity results in approximately $910,000 (1982 $) in additional costs. We have also added a construction management fee of $134,000, taking into consideration the scenario for system procurement which we are proposing.

Offsetting these increases, we have reduced the City's estimate of costs by eliminating the package boiler ($150,000), eliminating backup landfill acquisition ($137,000), estimating lower costs for front-end

loaders ($30,000), omitting the vehicle acquisition component ($400,000) and slightly reducing the contingency allowance.

We have slightly increased the City's estimate of start-up costs but would advise that the City consider additional increases here by budgeting for a one-year start-up. In the event these additional start-up funds are not needed, they can be maintained in the project as a reserve fund. We have used the estimates made by the City for other capital items.

With respect to the O&M costs, our estimate of plant labor is significantly higher than the City's. We estimate that a labor complement of 15 persons will be required as opposed to the CEIP estimate of 8-1/2 persons. Tables 5 and 6 present the revised cost estimates.

TABLE 5

1982

O&M COSTS

	($000)
Labor	$288.7
Maintenance Allowance	47.8
Fuel	10.6
Power	16.3
Water/Gas*	1.4
Disposal Costs:	
Ash	7.9
Unprocessables	5.7
	$378.4
G & A	12.3
TOTAL O&M	$390.7

*Assumes boiler feedwater obtained from wells.

TABLE 6

1982

CAPITAL COSTS

	($000)
Site Preparation	$ 138.2
Building	349.8
Land Acquisition/Relocation/Demolition	256.0
Incinerators	2,890.1
Truck Scale	30.0
Steamlines	150.0
Utility Additions	25.0
Front-End Loaders (3)	20.0
Ash Truck (1)	20.0
Utility Vehicle (1)	5.0
Miscellaneous Equipment	25.0
	$3,909.1
Engineering, Inspection[1]	$ 401.0
Construction Management[2]	134.4
G & A[1]	143.6
Permits and Fees[1]	24.0
Start-Up[3]	122.2
Contingency[4]	390.9
TOTAL	$5,125.2
ANNUAL DEBT SERVICE.	$ 333.7

[1]Retained from estimate in CEIP application.

[2]3.5% of site preparation through and including utility additions.

[3]Modified cost in CEIP application.

[4]10% of site preparation through and including miscellaneous equipment.

Estimate of Alternative Landfill Disposal Cost

The City's estimate of its own cost for disposing of its residential waste is approximately $14/ton. But we have chosen to use a much lower figure of $7/ton as the baseline for economically justifying the resource recovery project for several reasons. The Moss Point transfer operator will only deliver waste to the plant if it is less expensive than hauling it to a landfill. We estimate $7/ton as lowest possible cost for a very efficient transfer operation. But it should be understood that the number is derived from our own calculation of costs, not from an evaluation of the transfer operator's cost of doing business.

This figure also represents the lowest cost at which private collector would be able to dispose of Pascagoula's residential and commercial waste. The City is considering converting to totally private collection of its waste. If the City could set a tip fee competitive with the cost that a very efficient collector would incur for hauling waste to a landfill, then it should not anticipate any conflict between the economics of a resource recovery project and the economics of a private collection.

Projected Gas Prices

The projection of natural gas prices is the critical factor in making the economics of the project as attractive as they appear. The City should be aware that we have assumed that the price of gas will more than double over the next decade. There is inevitably some uncertainty on this issue. It is premised on the assumption that the process of deregulating natural gas prices set in motion by the Natural Gas Policy Act will not be reversed by a change in national energy policy at some future date. Therefore, gas prices will move toward parity with oil prices.

On this basis we have assumed escalation rates which are consistent with those used in Department of Energy and American Gas Association Reports on gas price trends. The results of this assumption are reflected in Tables 3 and 4.

PROJECT RISKS AND PROCUREMENT STRATEGY

In the introduction the issue of risk was cited as an aspect of resource recovery project implementation which distinguishes it from the usual public works enterprises normally undertaken by local governments.

- RESOURCE RECOVERY PROJECTS ARE RISKY for many reasons, but chiefly because:
  - Recovery technology is not fully proven
  - Waste volumes and composition are variable
  - Operating experience is limited
  - Product user requirements are stringent.

In the case of Pascagoula's project, these factors give rise to four important areas of project risk:

- PROJECT ECONOMICS, especially:
  - Lifetime operating and maintenance costs
  - Lifetime product revenues
  - Capital Costs
  - Lifetime net disposal costs.
- MARKETING, especially:
  - User requirements
  - User investments
  - Product prices
  - Contract duration.
- SYSTEMS PERFORMANCE, especially:
  - Product quality
  - Recovery efficiency
  - Processing capacity
  - Reliability
  - Residual disposal requirements.
- WASTE STREAM, especially:
  - Volume changes
  - Composition changes
  - Payment of disposal fees.

These risks can be managed or minimized.

Managing Risks

In proceeding with project implementation, the City must evaluate each area of risk and determine which participant in the project is in the best position to assume and manage a particular risk. For example, the City is in the best position to deal with the risk that a minimum daily tonnage will fail to be delivered to the project. In contrast the system vendor/operator is in the best position to deal with the risk that the system will not be able to process the waste tonnage it was designed to handle. In general, resource recovery projects are often organized on the principle that a specific risk should be assumed by that party to a project who is best able to manage or control it. In applying this logic to the economic and technical risks related to the performance of the technology selected for steam production, the City will need to devise mechanisms for assuring that the system vendor assumes these risks. System vendors are often asked to contractually assume performance and economic guarantees related to processing capacity, recovery efficiency, plant reliability and availability, product quality, and maintenance and operation costs in return for a service fee that adequately compensates them for the risk exposure they assume.

Should the City seek performance guarantees from a system vendor, it must devise a procurement strategy which reconciles the contractual assumption of performance guarantees by the vendor with the legal/institutional setting in which project implementation must occur. The method of system procurement is critical because a vendor is very unlikely to commit to meaningful performance and economic guarantees unless he has control over the entire process of system design, construction and operation. Moreover because the City is procuring a manufacturing enterprise, it is critical that it have the flexibility to negotiate these arrangements. The City's latitude in choosing a procurement approach may be affected by the method of project financing or by local laws which can make the assessment of meaningful performance guarantees a difficult and complex task.

PROCUREMENT APPROACH

There are three methods of procurement in implementing a project:

- A&E is the customary architectural and engineering contract for facility design and equipment selection, preparation of competitive bid specification, construction supervision, and (possibly) facility shakedown. Construction and equipment installation is competitively bid. Full-scale operation (and possibly shakedown) is the responsibility of the public owner.

- Turnkey involves a single entity performing the services provided by A&E plus construction and testing and shakedown of the system. Payment is made to the turnkey contractor following successful shakedown and acceptance by the public sponsor. Full-scale operation is the responsibility of the public owner.

- Full service involves a single contractor, who performs all functions of a turnkey contractor plus the responsibility for full-scale operations of the facility (generally ranging from 5 to 20 years).

Full Service: The Preferred Approach

The full-service approach vests the maximum degree of control in the vendor. As a result it offers the greatest opportunity for transferring risks and, thus, represents the preferred approach.

The table below relates the ability to transfer various project risks to private industry with the different procurement approaches.

KEY PROJECT RISKS	A&E	TURNKEY	FULL SERVICE
PROJECT ECONOMICS	NONE	LIMITED	SUBSTANTIAL
MARKET	NONE	NONE	SUBSTANTIAL
SYSTEMS PERFORMANCE	VERY LIMITED	LIMITED	SUBSTANTIAL
WASTE STREAM	NONE	NONE	LIMITED

Under the full service approach the City can accomplish maximum transfer of risk to the vendor/operator by obtaining contractual guarantees covering the technical performance of the system, capital and operating costs.

Constraints on Full Service Approach:

There are two significant constraints on Pascagoula's flexibility in choosing among these alternatives:

- The source of financing which the City has selected requires that ultimate ownership of the facility be public.
- Mississippi statutes stipulate that public authorities "must contract for public construction upon sealed competitive bids, letting contracts for such construction ...to the lowest and best bidder."

These constraints pose impediments to a full-service procurement because full service is usually done on a negotiated basis, given that critical system components are proprietary and because the lowest bid is not always consistent with obtaining the desired level of performance.

If the City desires performance guarantees, there is an adaptation of full-service procurement that may be possible under state statute. It is premised on the assumption that the City does have the flexibility to negotiate service contracts. Under this approach the City could "competitively" negotiate a service contract for system design, construction management, testing and facility operation, but facility construction would be done under sealed competitive bid. This service contract would be with a system vendor who satisfies the City's requirements with respect to commercially proven technology and the assumption of performance guarantees. There are two important stipulations that must be met in order to use this approach successfully:

- The City must be prepared to yield full control to the contractor to act as its agent during the construction management process.
- Although facility construction itself will be competitively bid, the City must recognize that the contractor will specify proprietary equipment for key components of the combustion system. To facilitate this, the City may need to pass resolutions establishing the public interest justification for proprietary specifications in a public construction bid.

Procurement approaches analogous to this have been used with other projects which confronted similar statutory impediments. However, these proposals would need to be reviewed with the City's Attorney as to their compatibility with state law.

NEXT STEPS

Pascagoula has set 1982 as the goal for having a resource recovery facility in commercial operation. This deadline imposes a demanding timetable on the City, given an anticipated start date for construction of December 1980.

In the intervening 14 months the City must conclude negotiations for the purchase of steam and delivery of waste, as well as organize and complete two facility procurement processes.

Critical Decisions/Milestones

- Organization and Manpower Assignments for RFP Preparation and Contract Negotiation.
- Commitments on Purchase of Energy and Delivery of Waste.
- Goals and Strategy of RFP.
- RFP Preparation, Issuance, Bidder Response.
- Evaluation, Selection, Contract Negotiations, Approval.
- Completion of All Necessary Environmental Reviews and Permit Approvals.

EXHIBIT 2

CONTRACT ISSUES
CITY OF PASCAGOULA
RESOURCE RECOVERY PROJECT

Section 4: Scope of Services

The city may want to be more specific regarding the contrator's responsibility for timely pickup of oversized, bulky waste items (e.g., refrigerators, bedsprings, etc.) which are not picked up during the regular collection. Present language gives the contractor one week for special collection of this material from the time it is placed at the curb. Conceivably, this would allow at best unsightly and at worst potentially hazardous or unhealthy conditions to persist for some time. The city might consider several alternate stipulations for collection of bulky items. For example, the city might establish one regular collection day for bulky trash items, or a regular collection day with the added proviso that the household notifies the contractor at least 24 hours in advance of the collection time that it has bulky trash for pickup; or requiring that the contractor make a special pickup within 24 hours of notification by a household that it has bulky trash for pickup.

In the scope of services, the city may want to consider specifying the days and hours during which residential and commercial collection can occur, as well as the policy to be followed on holidays. The city has an interest in assuring that collection occur during convenient hours. It is also important that a bidder know of any time constraints the city is imposing on collection, since these will have an impact on the level of capacity in terms of trucks and manpower which he must have available to provide twice weekly service. Conversely, in evaluating different bidders, the city will want to know that each is proposing an equivalent level of service. In the event the city eventually established a resource recovery system, it may want to schedule waste delivery to coincide with the steam requirements of the energy buyer. In the case of Quaker Oats, steam is only required on Monday through Friday. Since most waste would be disposed of and incinerated on the day it is collected, this suggests that the city would maximize steam revenues at the recovery facility with a Monday through Friday collection schedule. The city would need to balance this against any incremental costs resulting from five rather than six day collection weeks. If the city elects to have six-day-a-week collection, it may want to insert a caveat in the contract giving it the ability to amend the collection schedule should a resource recovery project be developed, with a consequent adjustment in fees.

The statement that collection must be three days apart is a bit ambiguous. Does this mean there shall be a three day interval between collection, or that collection shall occur on the third day following the last collection?

Section 5: Fees and Charges

We suggest the city consider several changes in this section. Use of the CPI All Cities Index as an escalator may entail windfall price increases to the contractor above and beyond the level required to cover inflation in his costs of doing business. The All Cities Index, because it incorporates the rate of inflation for consumer goods such as housing, food, and fuel in Northeast and West Coast cities, probably increases at a faster rate than the actual price level in the South and in Pascagoula particularly, where labor and housing price escalation will be tempered by Ingall's layoffs.

There are a number of alternatives the city might consider. A regional index or an index based on a neighboring metropolitan area might be used. The Department of Labor, Bureau of Labor Statistics, publishes monthly CPI indices on 24 urban areas. The urban area closest to Pascagoula is Atlanta, which is unlikely to be a good indicator of price changes in Pascagoula. To avoid an index biased towards large urban areas, the city might be better off using the regional index for the South. If the city does decide to use a single index, it should select the one most favorable to it, based upon plotting and comparing the rate of change in several alternative indices.

Since the CPI reflects price changes for consumer goods, it is not a good indicator of changes in cost patterns in a service industry. For example, the CPI is now inflating at about a 13 percent annual rate, while inflation in overall GNP is moving more slowly, at about a ten percent rate.

Instead of using a single index, the city could stipulate that the contractor allocate his total price on a percentage basis among labor, fuel, and equipment components, and then tie escalation in each of these components to an index reflecting actual price increases in these categories. Both the Bureau of Labor Statistics and the Department of Energy publish data on price increases in various fuels for regions and various cities. Labor costs can be indexed to changes in the Gross Average Hourly Earnings for Production Workers. (I believe there is a breakout of this data for Jackson, Mississippi.) The composition of this index should also be checked to insure that increases reflecting payment for overtime are screened out. There is also an annual wage survey that breaks out hourly wage data on various categories of service workers for the Mobile-Pensacola area, but it is not certain that the area will be included in the survey every year.

The Producer Goods Price Index could be used as a basis for escalating equipment cost by selecting a category of goods within that index which reflects changes in the price of trucks, etc.

In considering the approach of using several indices the city should investigate here as well the past behavior of these data as compared to the single CPI approach.

We suggest modifying the fee clause so that the contract price will be specified in more detail than a single lump sum monthly figure for several reasons. The city wants to evaluate whether private residential collection service is a less costly alternative than its present public collection service. The fee should be quoted on a basis that enables the city to make this determination. The city wants a fee clause that deals with the eventuality of a resource recovery facility in terms of specifying the basis for setting the tip fee a contractor would pay to dispose of waste at the plant rather than through landfilling. The present language does not adequately protect the city's interest in this area because it does not establish a basis for determining the contractor's cost for hauling and disposing of waste, as opposed to collection cost. (By haul costs, we mean the cost of moving waste from the end of the collection route to the disposal site. Disposal cost would be equivalent to a dump fee.) If this issue is not resolved in the contract, then the city could be at a serious disadvantage in negotiating with the contractor to obtain the waste supply it must have for a feasible project at a tip fee price required to balance the economics of the project.

Finally, the city may have an interest if it makes a transition to private collection in eventually setting user fees that pass through the full cost of this service to residential households and commercial businesses. In the event that a resource recovery project is established, then the portion of this fee covering haul and disposal costs could be the source of revenue for covering Pascagoula's share of the tip fee at the plant.

All of the considerations cited above argue that the city should structure the fee clause to enable a determination of costs by several categories. If the city can distinguish between residential and commercial costs, it could assess whether the overall price is less than the cost of the currently split service between private collection of commercial waste and public collection of residential waste. It would also have a basis for setting user charges for residential and commercial customers.

In terms of giving the city an ability to know what portion of the total price should be attributed to hauling and disposal costs, and thus equated to a tip fee, the city could ask that a price be specified for these cost components. The contract should stipulate that the city has a right to require the delivery of waste collected within the city to its resource recovery plant at a fee not to exceed the combined price of haul/disposal services as indicated in the contract

fee schedule, and should the tip fee be less than the combined cost of haul/disposal, then the city has a right to reduce its payment to the contractor by this amount.

In essence, the city may want to have the fee broken down into the following matrix:

CATEGORY OF COST	CATEGORY OF SERVICE		
	Residential	Commercial	Totals
Collection			
Haul			
Disposal			
Totals			

In addition to specifying this price breakdown in the contract, the city can make two credible arguments for asking potential contractors to justify their bid by providing more detailed cost and operating data in supporting bid documents or in negotiations. First, the city can state that its decision to contract for private collection will be made on the basis that the cost will be less than it is now paying for a mixed private/public collection service. Second, the city can argue that it must see the data which the contractor is using to allocate his costs among collection hauling and disposal categories to be assured that these cost allocations are reasonable, and similarly that the contractor must also show the data which are the basis for allocating costs among fuel, labor, and equipment for purposes of escalation.

It is likely that a bidder will be reluctant to share this information with the city under the claim that it is proprietary and must be protected from his competitors. In that event, the city could propose that the data will be kept confidential and not made a part of any public records relating to the contract or bid.

Examples of cost data that would be useful to the city in evaluating bids would include:

- estimated gallons of fuel and fuel expense.
- category of labor and number of persons with salaries or hourly rates.

- disposal fees on a per-ton or cubic yard basis.
- type and number of pieces of equipment and annual depreciation charges and estimated repair and maintenance expense.
- overhead and other expenses.

This could be supplemented by asking the contractor to present a tentative operating plan with the following:

- collection schedule and routes.
- number of trucks and crews assigned to each route.
- crew size.
- method of transport, travel time, number of trips to landfill.
- method of supervision.
- vehicle maintenance and replacement schedule.

Section 12: Ownership and Disposal of Garbage

The language which vests ownership of garbage in the contractor poses the potential for serious difficulty if the city implements a resource recovery facility. While the present language does minimize any potential liability to the city, it also minimizes the city's control of the waste and therefore its ability to assure that all waste collected in Pascagoula will be delivered to a resource recovery facility. If it chooses to implement a project, the city must be able to assure that a supply of waste adequate to meet contractual commitments for producing steam for a buyer can be delivered to the facility over its economic life of 30 years. If the contractor owns the waste collected, then he theoretically has a right to engage in resale of marketable fractions, such as newsprint or cardboard, to other buyers, which would reduce the BTu value of the waste disposed of.

It is also conceivable that the contractor could have a less expensive, more profitable alternative method of waste disposal than that offered by delivery to the city resource recovery plant. Based on our experience, we feel that if the city were planning to finance the project through a conventional project revenue bond approach, rather than the CEIP loan, the current contract language would preclude successful sale of bonds to investors. It might also raise a question in a potential energy buyer's mind about the city's ability to obtain sufficient waste to meet contractual requirements.

We suggest that the city consider separating the issue of protecting itself from liabilities that might arise from the contractor's performance from the question of ownership. It could accomplish the

former by strengthening Section 9, Indemnity. The city has a powerful argument to make here in its own behalf because it is essentially giving the contractor an exclusive franchise to do business under a contract which is likely to be renewed for several terms. In terms of the latter, it is in the city's interest to maintain ownership as the best legal method of assuring its ultimate right to direct the waste to a disposal facility of its choice, as well as to keep open the option of doing recycling at some future date. This point would be established in contract language by specifying that the city maintains ownership and the contractor acts as its agent in disposing of waste.

Clauses b and c of this section also address the question of where waste shall be disposed of. These sections could be improved to protect important city interests. In the absence of a resource recovery facility, the city wants to assure its citizens that waste is disposed of in facilities that meet all current and future environmental standards. It is also reasonable to anticipate that in future years, state and federal environmental controls on landfilling will become more rigorous. In light of these considerations, Subsection b could be modified to require that waste be disposed of in facilities designed and constructed to meet all applicable environmental standards, and having all the required environmental permits and licenses, and operated in conformance with current and future environmental regulations. It should also be stipulated that failure of the contractor to meet this requirement is not a basis for invoking a force majeure claim under Section 13(e); that is, if the contractor' landfill operation is closed or penalized because of failure to conform to environmental regulations, he is not relieved of his performance obligation under this contract.

In this same clause, the city might consider establishing its right to designate the landfill disposal site and then specify that location in the contract. The city could offer the contractor the option of proposing an alternative disposal site to the one designated if he could show a lower disposal fee, and if it conforms to environmental standards.

Subsection c should be changed to clearly state the city's unqualified right to direct waste to a resource recovery facility should one be developed. The present language makes this conditional on the price charged. As discussed in the section on fees, the question of how the price will be set should be dealt with explicitly. The city might make this proposal more palatable to the contractor if it in turn offered the contractor the option of taking residuals and bypassed waste from the resource recovery facility to the landfill, making this contingent on acceptable performance by the contractor and satisfactory negotiation of a fee.

Section 13: Contractor's Relation to the City

Clauses e and g in this section deal with the issue of "force majeure," that is, the conditions under which the contractor is relieved of his responsibility to perform because of an occurrence outside of his control, and procedure to be followed in the event the city determines that failure to perform is a basis for terminating the contract.

Clause e should spell out the contractor's obligation to notify the city immediately in the event of such occurrence and to make every good faith effort to resolve the problem and regularly inform the city of progress in doing so. In the event the contractor should claim force majeure as a basis for terminating the contract, as opposed to a temporary interruption of his services, he should be required to show economic frustration; that is, he is losing money rather than making a profit. In this case, the contract might also specify the burden of proof that the contractor shall meet. This could be done by stipulating the type of accounting information he would have to provide to establish a certain magnitude of financial loss experienced over a certain period.

The city should be particularly concerned with the question of how a strike is treated in this clause. It is requiring the contractor to give right of first refusal to its present collection force which in unionized. A strike of his own work force is not a condition entirely outside the control of the contractor. A requirement for good faith bargaining should be defined and a time period ought to be specified for resolving the strike. In the event this time requirement is not met, the city would have a basis for invoking breach of contract.

With respect to the procedures defined in clause g for invoking breach of contract, we suggest that the city may want to protect itself against a charge of arbitrary action by spelling out some due process requirements for notifying the contractor that conditions for a breach exist, and providing him an opportunity to specify how these conditions will be corrected within a limited time period.

Under the present language, the options available to the city when a breach of contract is found are to do nothing or to take over the performance of the contract. The city might desire the option of a third, less extreme alternative--the imposition of a daily financial penalty on the contractor. In this case, the city should specify the amount and duration of the penalty.

Finally, this section appears to be the appropriate place for the city to specify data that it may want the contractor to provide on a periodic basis. Of particular interest here is the quantity of waste collected by the contractor. It would be very valuable to

have accurate weigh data as planning for the resource recovery facility proceeds. This could be done through a periodic weighing program that should not be unduly burdensome to the contractor, particularly if it is BFI, since they now have operational scales at their landfill.

EXHIBIT 3

JUSTIFICATION FOR REVISIONS
IN THE
APPLICATION FOR CREDIT ASSISTANCE
FROM THE
COASTAL ENERGY IMPACT PROGRAM
FOR THE
CITY OF PASCAGOULA'S
RESOURCE RECOVERY PROJECT

October 2, 1979

INTRODUCTION

CSI Resource Systems has recommended two significant revisions in the City of Pascagoula's Resource Recovery Project which result in higher estimated project costs. These are:

- increasing the design capacity of the energy recovery system from 100 tons per day (TPD) to 150 TPD.
- providing additional funds on a contingency basis to cover inflation in construction and equipment costs in the event that the beginning of commercial operation is delayed from 1982 to 1983.

The purpose of this report is to present the reasons on which these recommendations are based, evaluate the impact of the increased costs on project economics, and provide the City of Pascagoula with the documentation it may need to obtain an increase in the amount of the loan commitment for project financing from The Office of Coastal Zone Management under the Coastal Energy Impact Program. The case for each of these proposals is discussed in the following sections of the report.

EXPANDING SYSTEM DESIGN CAPACITY TO 150 TPD

System capacity should be increased by 50 TPD for several reasons. The most recent estimates made by Resource Systems of the quantity of waste available to the project indicate that additional capacity is desirable. Table 1 summarizes these data to show that on a five-day per week basis there is an average of 110 TPD of waste available. The five-day week is selected because it matches the production schedule of the presumed energy buyer, Quaker Oats Company, permitting conversion of the maximum amount of available waste into steam for sale. Conversely, a 100 TPD system would not be able to process this waste supply on a five-day basis. The system would either have to divert a significant amount of waste directly to landfilling or operate additional weekend shifts to burn waste without steam production. In either case operating costs would be significantly increased without any offsetting revenues.

The 100 TPD sizing does not take into account the need for redundancy in equipment capacity in order to accommodate scheduled maintenance.

Table 1

Waste Stream Analysis

Source	Controlled by	Average Available Tonnage[1]	
		Annual	Daily
Pascagoula:			
Residential Collection	City of Pascagoula	7,636	30.3
Commercial Collection	BFI[2]	11,718	46.5
Moss Point	Moss Point Station Operator[3]	8,366	33.2
	TOTALS:	27,720	110.0

[1] Based upon a five-day week.

[2] Although BFI technically owns the commercial waste it collects in Pascagoula, the City, through the mechanism of contract negotiation and renewal, has the ability to obtain control of this waste at a reasonable price and assure its delivery to a resource recovery plant.

[3] Moss Point has a contract with a Transfer Station Operator extending through 1983. The Transfer Operator has title to, and thus ultimate control of, this waste.

In a configuration of four 25 TPD modules at least one unit would be down for maintenance a substantial portion of time, reducing available system capacity during this period to 75 tons per day. Alternatively, a configuration of three 50-TPD modules is a more effective and less costly solution to the redundancy problem. It also provides the capacity to meet daily and seasonal surges in waste volume, which the data indicate would approach 130-TPD levels on occasion.

The 150 TPD has the capacity to absorb growth in the waste supply. This is important because the 110 TPD of waste presently available only satisfies 75% of Quaker Oats steam requirements. As additional waste becomes available the system can increase steam revenues at very little increase in costs.

The 100 TPD system does merit consideration as an alternative to the 150 TPD system on the assumption that it would handle Pascagoula's waste only, thereby excluding Moss Point from the system. Given that the volume of Pascagoula's waste is estimated at 78 tons per day, a 100 TPD system would provide adequate redundancy and surge capacity for this waste stream. The City's decision between a 150 TPD system servicing Pascagoula and Moss Point versus a 100 TPD system servicing Pascagoula only can be based on a comparison of the economic merits of these alternatives. The City should choose the system that offers the lowest net disposal cost to Pascagoula. The following analysis presents the cost and revenue assumptions of each alternative and estimates the net cost of disposal per ton. This is equivalent to the "tip fee" for refuse disposal at the plant which the resource recovery plant must charge in order to produce sufficient revenues to cover costs. The City has estimated its present cost of landfill disposal at $13.90/ton, a figure which includes the cost of hauling and dump fees but excludes in-city collection costs. A tip fee that is less than this confirms that the resource recovery is the most economically attractive disposal option. The City is also interested in estimating the tip fee over time, since landfill costs can be expected to escalate significantly in years ahead because of rising fuel costs, investments needed to meet new environmental standards and the higher incremental cost of adding new

landfill capacity. A tip fee that escalates more slowly than landfill disposal or remains relatively stable over time reinforces the economical attraction of the recovery option.

There is an additional constraint in evaluating the tip fee for the 150 TPD project. Since this project incorporates the waste from Moss Point, the tip fee must be sufficiently low to assure that this waste is delivered to the project. Because Moss Point uses a transfer operation, it has relatively lower disposal costs than Pascagoula. Using very conservative assumptions, it is estimated that a tip fee in the $7 to $8 per ton range will capture the waste from Moss Point. In summary, the 150 TPD system is justified only if its tip fee is both lower than current landfill costs and the tip fee of a 100 TPD system, and also low enough to attract Moss Point waste.

METHODOLOGY

System Costs

Table 2 presents revised cost estimates for the two alternative systems. Two cost items included in the City's CEIP loan request, landfill acquisition at $137,200 and truck acquisition at $400,000 are not included in project costs because the City has justified these items on grounds external to the economics of the project. The major cost difference between the two alternatives is $900,000, representing the cost of the additional 50-ton energy recovery module. The notes associated with the table explain other variations in these cost estimates from those in the original CEIP application. Although not included in the loan request, the annual O&M cost estimates used here are also higher than those originally estimated. Comparing costs for the two systems indicates some of the economy-of-scale advantages of the larger system. Although the 150 TPD has 50% greater capacity than the 100 TPD, its capital costs are only 25% greater. The cost advantage of the 150 TPD is even more apparent in comparing annual O&M costs which are almost equivalent because both systems require the same labor complement.

Table 2*

1982 Pascagoula Project Costs (in $1000)
100 TPD_5 and 150 TPD_5

	150 TPD_5	100 TPD_5
Administration Expense (1)	$118.6	$118.6
Preliminary Expenditures (1)	24.0	24.0
Land Structures/R/W (1)	160.0	160.0
Engineering (1)	270.0	270.0
Other Engineering Fees (1)	35.0	35.0
Project Inspection (1)	96.0	96.0
Land Development (2)	--	--
Relocation Assistance (1)	6.0	6.0
Relocation Payments (1)	60.0	60.0
Demolition (1)	30.0	30.0
Project Costs (3)	3583.1	2619.7
Equipment Purchase (4)	70.0	70.0
Miscellaneous (1)	25.0	25.0
Development Expense (5)	122.2	122.2
Contingencies (6)	390.9	294.6
Construction Management (7)	134.4	100.6
	$5125.2	$4031.7
Capitalized Interest During Construction (8)	173.3	121.6
	$5302.5	$4153.3
Annual Project Cost		
Annual Debt Service (30 yrs @ 5% levelized payments)	345.1	270.4
Annual Operating and Maintenance (9)	390.7	378.4
TOTAL ANNUAL EXPENSE	$735.8	$648.8

*See pages 14-17 for Notes on Revisions.

System Revenues

The critical element in project economics is the revenue realized from the sale of an energy product. The price of this product to the energy buyer is primarily dependent on the cost of the conventional fossil fuel it displaces. The price must be such that the buyer will have an incentive to purchase all the energy the system can produce up to 100% of his requirements. Therefore, the price must recognize some discount in the cost of the conventional fossil fuel displaced. Typically the contracts between a resource recovery project and its energy buyer recognize this discount and also include formulae to escalate the price of the energy product as a function of escalation over time in the cost of conventional fossil fuel that the buyer would otherwise use.

The first step in estimating the energy revenues for this project is to make some assumptions about escalation in the cost of gas now used as fuel by the presumed energy buyer, Quaker Oats Company. The present cost of gas is $2.89 per thousand cubic feet (mcf). Escalation factors are derived from reports by the Department of Energy and the American Gas Association which are consistent with the municipal gas utilities' own estimates. The following escalation factors are used:

Period	Rate of Escalation (compounded annually)
1979 - 1982	11%
1983 - 1985	10%
1986 - 1991	7%

The gas prices resulting from these assumptions are consistent with those that result from the continuation of present national energy policy which is gradually deregulating the price of gas to permit it to move toward parity with the price of #6 oil, which on an energy-equivalent basis with gas now costs $3.70.

The discount at which the project sells steam will depend upon the outcome of negotiations between Pascagoula and the Quaker Oats Company. To develop a revenue estimate, it is assumed that the discount schedule must balance the respective interests of Quaker Oats Company in obtaining steam at the lowest possible cost and the City of Pascagoula

which desires a tip fee that is reasonably stable and lower than its alternative landfill costs. It is assumed these interests are reconciled by trading off a low discount in the early years of the project which satisfies the City's tip fee objective for a high discount in later years which satisfies Quaker Oats Company's objective for a substantial price advantage over gas. It is important to note that this pricing schedule is assumed only for purposes of this analysis. It is not intended to suggest or predict the outcome of negotiations between Quaker Oats and the City of Pascagoula on this issue.

The price schedule is developed according to the following formula:

$$\text{Cost of Gas (\$/mcf)} \times \text{Discount} \times \left(\frac{1400 \text{ cf}}{1000 \text{ lbs steam}}\right)^{*} = \text{Steam Price (\$/M lbs)}$$

Table 3 below presents the resulting schedule of steam prices for the period 1982 through 1991.

Table 3

Steam Pricing Schedule
(1982 - 1991)

Year	Gas Cost $/mcf	Discount %	Conversion Efficiency Factor	Steam Price $/1000 lbs
82	3.95	5	1.4	5.25
83	4.31	10	1.4	5.43
84	4.77	10	1.4	6.01
85	5.25	15	1.4	6.25
86	5.68	15	1.4	6.76
87	6.08	20	1.4	6.81
89	6.52	20	1.4	7.30
89	6.99	25	1.4	7.34
90	7.49	25	1.4	7.86
91	8.00	25	1.4	8.40

Comparison of System Economics

Given the cost and revenue assumptions already stated, the economics of the 150 TPD system can be compared with the 100 TPD system. Other important parameters of both systems for purposes of the comparison are listed in Table 4.

*Quantity of gas required to produce 1000 lbs of 100 psig saturated steam.

Table 4
System Characteristics
1982

	150 TPD	100 TPD
Waste Received	27,720 Tons	19,660 Tons
Waste Accepted	22,180 Tons	15,720 Tons
Waste Processed	21,730 Tons	15,410 Tons
Heat Value of Solid Waste	4,300 Btu/lb MSW	same
System Efficienty	65% (2.35 lbs steam/lb MSW)	same
Annual Operating Days	252	same

Table 5 compares the economic performance of both systems at specified intervals over 10 years. The key point of comparison is the net disposal costs per ton of each system.

Table 5
Comparative System Economies
100 TPD vs. 150 TPD

	1982		1985		1988		1991	
	100	150	100	150	100	150	100	150
Annual Debt Service	270.4	345.1	270.4	345.1	270.4	345.1	270.4	345.1
Annual O&M Costs	378.5	390.7	463.8	478.9	568.4	587.0	646.6	719.5
Total Annual Expense	648.9	735.8	734.2	824.0	838.8	932.1	967	1064.1
Annual Energy Revenues	381.0	537.3	400.4	649.3	545.8	719.8	637.6	899.1
Net System Cost	267.9	198.5	273.8	174.7	293	212.3	329.4	165
Net Disposal Cost/Ton	17.04	8.95	17.16	7.76	18.08	7.10	20.03	7.13

Conclusion

The economics of the 150 TPD system are clearly superior with a tip fee of less than half that of the 100 TPD system. Although the 150 TPD system has higher capital cost, it yields a disproportionately greater amount of revenue than the 100 TPD system. This revenue is escalating at a faster rate than O&M costs, due to escalation in the price of gas. Both systems are competitive with Pascagoula's cost of landfilling, which will escalate from the present level of $13.90/Ton. The tip fee for the 150 TPD system is sufficiently low to make it advantageous for Moss Point to deliver its waste to the resource recovery project rather than to the landfill.

CONTINGENCY FOR INFLATION IN THE EVENT OF DELAY

CSI has recommended that the City budget for an additional year of inflation in the cost of construction and equipment in the event that construction does not commence until midyear 1981. In doing so it is not the intent to challenge the validity of the City's estimated timetable in the CEIP which is well thought out and could be achieved. In that event, these additional funds would not be required and would revert to the Office of Coastal Zone Management. However, there are critical factors beyond the City's complete control which can influence the project timetable. Most importantly, the project must complete contract negotiations with three parties; the energy buyer for purchase of steam, Moss Point for the delivery of waste, and the systems vendor for design construction and operation of the plant. The City can not be assured of the cooperation of these parties in meeting the project timetable, although it is reasonable to assume that the economic incentives offered by the project to each party will gain their eventual participation.

In the event of delay causing substantial inflation in project costs, the City could be faced with the need to raise additional funds under difficult circumstances. Its own operating budget is likely to be under continuing financial strain as a result of the impact of Hurricane Frederick. Its ability to borrow new funds would be constrained by the need for voter approval of a new bond election order. Moreover, this borrowing

would be at a higher interest cost with a consequent impact on project economics. Its ability to raise equity funds is constrained by the CEIP program requirement for public ownership of the project, which precludes equity participation by private investors. The potential inability to raise additional funds at some point in the future introduces an element of uncertainty into the project that it is highly desirable and possible to avoid at this stage by both obtaining an increase in the CEIP loan commitment and establishing this amount as the maximum authorized by the Bond Election Order. It is important to note that these two amounts should be consistent to avoid creating an impression in voters' minds that the City's representations as to the cost of the project and sources of financing are inconsistent.

The fact that project cost estimates have increased over the estimates made in its CEIP application should not cause undue concern. Cost estimates in a resource recovery project typically have substantial uncertainty in the early stages of project implementation. This is the case because key issues affecting project economics, such as selection of the energy conversion technology, the pricing schedule in the contract with the energy buyer, and the allocation of risk among project participants are still unresolved. It is unusual that in this project the financing commitment is being made at a very early stage. Normally the amount of financing for a project is not finally set until contract negotations are substantially complete, preliminary design has been completed, and construction is about to begin. The availability of an early financing commitment has real advantages in allowing the City to proceed confidently with an expedited implementation schedule as well as with a higher degree of credibility among potential systems bidders. These factors could result in lower ultimate costs to the City. But it is advisable at this time that the City proceed on the very prudent basis of making conservative estimates of project cost.

The remaining issue is whether this projected increase in costs would affect the economic feasibility of the 150 TPD system.

Methodology

The net disposal costs of the 150 TPD system are estimated using revised project costs that assume the impact of inflation on construc-

tion and equipment arising from a one-year delay in the beginning of construction.

Table 6 with explanatory notes presents the line item estimates for capital costs of the 150 TPD system in 1982 dollars and escalates these costs by an appropriate factor to 1983.

All of the assumptions and methods used in estimating disposal costs for the previous system apply here with the exception that the discount schedule for steam prices is advanced one year. This results in the following schedule of discounted steam prices:

Year	$/1000 lbs
1983	5.73
1984	6.01
1985	6.62
1986	6.76
1987	7.23
1988	7.30
1989	7.83
1990	7.86
1991	8.40

Table 6*

1983

Capital Costs

150 TPD_5

	($000)		
	1982	Esc. Fac.	1983
Administration Expense	$118.6	NA(1)	$127.0
Preliminary Expenditures	24.0	NA(1)	25.7
Land Structures/R/W	160.0	1.084(2)	173.4
Engineering	270.0	NA(1)	289.0
Other Engineering Fees	35.0	NA(1)	37.5
Project Inspection	96.0	NA(1)	102.8
Land Development	--	--	--
Relocation Assistance	6.0	1.059(2)	6.4
Relocation Payments	60.0	1.059(2)	63.5
Demolition	30.0	1.084(2)	32.5
Project Costs	3583.1	1.07(2)	3833.9
Equipment Purchase	70.0	1.07(2)	74.9
Miscellaneous	25.0	NA(1)	26.8
Development Expense	122.2	NA(1)	130.8
Contingencies	390.9	NA(1)	418.4
Construction Management	134.4	NA(1)	143.9
	$5125.2		$5486.5
Capitalized interest during const.	176.3	NA(1)	188.7
	$5301.5		$5675.2
Annual Debt Service	$345.1		$369.5

*See page 17 for Notes.

Table 7 presents revised cost and revenue estimates under these assumptions.

Table 7

150 TPD System Completed in 1983

	1983	1985	1988	1991
Annual Debt Service	369.5	369.5	369.5	369.5
Annual O&M Costs	418.2	478.9	587.0	719.5
Total Annual Expense	787.7	848.4	956.5	1089.
Annual Energy Revenues	558.5	649.3	765.8	899.1
Net System Cost	229.2	199.1	186.7	189.9
Net Disposal Cost per Ton	8.90	7.14	8.17	8.19

Conclusion

The impact of an additional $373,000 in capital costs is minimized by the liberal financing terms which reduce this amount to an annual increment in debt service costs of approximately $24,000. This results in an increase of approximately $1 in the tip fee of this system versus the 150 TPD system in 1982 $. The net disposal costs of this system are superior to the City's current cost of landfill disposal, and the additional investment required in the event of a one-year delay is clearly justified.

Notes of Revisions in Project Costs

(1) Same as Original CEIP Estimate.

(2) Omitted.

(3) Broken Down as Follows:

	150 TPD_5	100 TPD_5
Clearing & Grubbing, Drainage	$138.2	$138.2
Incinerator Building:	349.8	349.8
Incinerators	2890.0	1926.7*
Package Boiler (omitted)	--	--
Misc. (Scale, Steamlines)	180.0	180.0
Utility Additions	25.0	25.0
TOTAL	$3583.1	$2619.7

(*2/3 of 150 TPD_5 figure.)

(4) Broken Down as Follows

	100 and 150 TPD_5
Front End Loaders (2)	$20.0
Ash Truck (1)	20.0
Utility Vehicle (1)	5.0
Misc. Equipment	25.0
Collection Vehicles (omitted)	--
TOTAL	$70.0

(5) Broken Down as Follows:

Contract Labor	$42.5
Other (@ 3 mo. instead of 1)	13.4
Per Diem	20.0
Special Cons. Lump Sum	10.0
Fuel Costs	14.0
Miscellaneous	8.0
City Supt.	14.3
TOTAL	$122.2

Notes (continued):

(6) 10 percent of total of land structures/R/W and relocation assistance through and including equipment purchase

(7) 3.5 percent of total of land structures/R/W and relocation assistance through and including project costs; not included in CEIP estimate.

(8) 5 percent per year, for two years, on an amount of the loan outstanding equal to one-half of the total project cost, less interest earned by City on loan funds kept on 8 percent interest bearing deposit in City bank account. The average amount of this deposit is assumed to be one-half of periodic 20 percent drawn down of the total CEIP commitment.

(9) Revised O&M Costs

For $150TPD_5$ System same as outlined in CEIP application, except for following change:

A) Fixed Cost - CEIP O&M $ $90.1

1) Modify Labor Cost

- Add all other necessary labor in addition to 2 persons in CEIP direct labor budget.

(1) Plant Mgr @ $20K/yr + 30% = $26K/ea
(2) Extra shift mgrs @ $15K + 30% = $19.5K/ea
(4) Primary operators @ $5/hr + 30% = $13.5/ea
(1) Ash truck operator @ $5/h4 + 30% =
(4) Shift main. men/relief loader operators @ $5/hr + 30% = $13.5K/ea

TOTAL ADDITION = + 186.5

(Some of the above additions are affected by by moving variable labor to fixed category.)

- Change mechanics from part-time to full time - $6/hr = 30% = $16,200/yr as part-time - $8.1K/yr ∴ Δ = $8.1K/yr + 8.1

(Total Labor Force = 15 people)

TOTAL FIXED O&M = $284.7

Notes (continued):

B) Variable Cost

	CEIP $	$5.47/Ton
1) Delete cost of nat'l gas overestimated	-	1.50/Ton
2) Delete var. ash dis. cost (accounted separately)	-	.14/Ton
3) Delete var. labor cost (accounted as fixed labor)	-	2.79/Ton
TOTAL VAR. O&M COST	=	$1.04/Ton

TOTAL ANNUAL O&M ESTIMATE -

- TPY handled = $(110TPD_5)$(252 days)(.8) = 22,176 TPY
  (aver.) (availability)

- TOTAL O&M = $284,700 + ($1.04/ton)(22,176)
  = $307,763 (1979)

- Escalated @ 7% to 1982 $307,763$(1.07)^3$ ≈ $377,000

- Line item 1982 O&M Costs

	($000)
Labor	$288.7
Maintenance Allowance	47.8
Fuel	10.6
Power	16.3
Water/gas[1]	1.4
Disposal Costs	
Ash	7.9
Unprocessibles	5.7
	378.4
G&A	12.3
TOTAL O&M	$390.7

1) Assumes boiler feedwater obtained from wells.

Notes (continued):

100 TPD_5 System
O & M Costs
(Pascagoula only - 78 TPD_5 Ave.)

A. FIXED COST - Same as 150 TPD_5 System = $284,700

B. VARIABLE COST - Same as 150 TPD_5 System =
= $1.04/Ton

TPY processed = $(78TPD_5)(252)(.8)$ = $15,724,8
var.$ = $(\$1.4)(15,727)$ = $16,354 + 16,354

TOTAL $301,054

1982 $ = $\$301,054(1.07)^3$ ≈ $368,800

(Not including ash and unprocessibles disposal costs.)

Notes on Table 6 Revisions

(1) Escalated to be same percentage of construction costs as found in 1982 costs.

(2) Excalation factors are based upon extrapolations of trend line analysis 1971-1978 for the following cost indices by category which were converted to a base year of 1979:

- Relocation Assistance and Payments - Consumer Price Index to mid-year 1981.
- Site Preparation - Engineering News-Record Building Cost Index until January 1983.
- Building - Engineering News-Record Building Cost Index until January 1983.
- Process Equipment - BLS General Purpose Machinery and Equipment Index through first quarter 1982.

EXHIBIT 4

- WHAT IS IT?
- CAN IT BENEFIT PASCAGOULA?
- SHOULD YOU AS A VOTER SUPPORT AN ENERGY RECOVERY PROJECT IN PASCAGOULA?

VOTE

·YES·

Jan. 29, 1980

CITY OF PASCAGOULA
MISSISSIPPI

ENERGY RECOVERY--

why you
should vote
YES!

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The answers to these questions are important because our community confronts increasingly costly problems with both waste disposal and energy supply. **Energy Recovery** contributes to solving these problems by converting the wastes discarded by residents and businesses every day into useful energy.

Each year 19,000 tons of waste are hauled to a landfill 25 miles from Pascagoula and buried. The energy in this waste is equivalent to about 170 million cubic feet of natural gas — an amount of energy we use to heat all the homes and businesses in Pascagoula during two winter months.

Energy Recovery uses technology to convert waste to energy in the form of steam or electricity for use by industry. If you think about it, it is an idea whose time has come. Should we continue to bury waste paper, plastics and other discarded combustibles in landfills when these materials could be used to replace our increasingly scarce and expensive supplies of oil and gas?

Other communities have considered energy recovery, and today there are 14 plants being built or operated with the capacity to convert 14,000 tons of waste each day into steam or electricity which is sold to industrial or utility buyers. These communities have been motivated to choose **Energy Recovery** because:

- It is economically advantageous:

  Communities can lower their waste disposal costs by obtaining revenues from the sale of energy to a buyer and by reducing the amount of waste ultimately transported to a landfill to 10 percent of its original volume.

- It is environmentally attractive:

  Plants are designed as modern industrial facilities with up-to-date environmental controls, not the smoke-belching incinerators of years past.

  Reducing the quantity of waste that must be landfilled minimizes the degradation of our land and water resources.

Your city government has actively investigated the question: Does **Energy Recovery** make sense for Pascagoula?

In seeking an answer to this question, we are most concerned about reducing the impact of our present high waste disposal costs on our municipal budget. However, we are also attracted by the environmental and energy conservation benefits of **Energy Recovery**.

In 1978 it cost the City of Pascagoula $14 to haul and landfill each ton of our garbage. Our natural environment is the most important factor accounting for this high cost. Because we are surrounded by coastal flood plain, the only landfill available to us requires a 50 mile round trip. This long haul distance consumes a lot of time, substantial quantities of gasoline, and puts considerable wear and tear on our vehicles, causing breakdowns in our collection schedule. If we remain solely dependent on landfilling to dispose of our wastes, we can expect our disposal costs to increase significantly. Because gasoline prices will escalate, new environmental standards will make landfilling more costly, and we will ultimately face the problem of finding new landfill capacity.

Our goal is to avoid increasing the burden of these costs on our taxpayers and citizens. Among the actions your city government has taken to determine if **Energy Recovery** makes sense are:

- Identifying a possible buyer for the steam that could be produced by a plant.
- Investigating Energy Recovery technologies in operation in other cities, and finding that these systems could perform satisfactorily in Pascagoula.
- Utilizing the services of a local engineering firm to determine on a preliminary basis the technical and economic feasibility of the energy recovery concept.
- Obtaining technical assistance at no cost from the U. S. Environmental Protection Agency to further evaluate the economic and technical feasibility of an energy recovery project.
- Obtaining a commitment from the U. S. Department of Commerce to loan the funds necessary to finance the project on very reasonable terms for 30 years at 6 percent, provided that the voters authorize the City Council to accept this loan offer through a bond election.

On the basis of our investigation, we have concluded that Energy Recovery appears to be the most economic method of waste disposal for the city. Although it will cost us less than landfilling on an annual basis, an investment of as much as $6 million in plant and equipment may be required in order to reduce our disposal costs. Under the terms of our loan offer, this investment would be repaid with revenues from the project. These revenues will come from the sale of steam to an industrial firm and from charges assessed on waste disposal at the plant. The loan would not be a general obligation of the City of Pascagoula, nor affect the tax rate. Although there is more work to be done before we finally conclude that we should implement an Energy Recovery project — you, the voters, have a crucial role in deciding whether we should proceed further.

Your vote on the Bond Election on January 29th will determine whether we can accept the financing offer from the Department of Commerce. If you disapprove the bond authorization, the Department of Commerce will withdraw its loan offer, and this source of financing will no longer be available to the project.

Should you approve the bond authorization, the city will take the following steps:

- We will systematically and vigorously proceed to a final decision on implementing an energy recovery project, and we will keep you, the voters, fully informed of our progress.
- We will negotiate with an energy buyer for the purchase of steam produced by the plant.
- We will seek the cooperation of the City of Moss Point in the project, so that the overall costs will be more attractive to both cities.
- We will decide upon a method for acquiring an energy recovery system that is most likely to insure the long term successful operation of the facility.

We urge you, as a voter, to carefully consider your decision and vote on January 29, 1980.

CITY OF PASCAGOULA
MISSISSIPPI

PASCAGOULA ENERGY RECOVERY PROJECT

RADIO SPOT ANNOUNCEMENTS

On January 29, the voters of Pascagoula will go to the polls to decide the fate of the first energy recovery project in the State of Mississippi. You can call _____ _____for more information on this vital issue.

* * *

The City of Pascagoula is seeking voter approval in a January 29 Bond Election of a project that will lower the city's waste disposal cost by using that waste to produce steam for sale to an industrial buyer. (By the way, it now costs the city $14 a ton to bury that waste in a landfill.) For more information call_____.

* * *

Pending the decision of Pascagoula's voters in their January 29 Bond Election, the city may develop a project to recover energy equal to about 170 million cubic feet of natural gas from the waste it now buries in a landfill. (By the way, that amount of energy is about what it takes to heat all the homes in Pascagoula during the winter.) For more information call_____

* * *

The voters of Pascagoula are considering an alternative to landfill disposal of the 19,000 tons of solid waste collected in the City of Pascagoula each year. Voter approval of a January 29 Bond Election would authorize financing of an energy recovery project designed to lower the city's waste disposal cost. For more information call_____.

RADIO SPOT ANNOUNCEMENTS.....

* * *

Voters in Pascagoula will decide on January 29 whether the city should accept a low interest loan from the U.S. Department of Commerce to finance an energy recovery project. The loan will not affect the city's tax rate because it will be repaid with revenues from the energy recovery project. For more information call_____

* * *

EXHIBIT 5

CITY OF PASCAGOULA

ENERGY RECOVERY PROJECT

IMPLEMENTATION

FEBRUARY 12, 1980

ILLUSTRATIVE SCHEDULE OF TASKS

FOR PROJECT IMPLEMENTATION

Milestones	Tasks	Types of Expertise Required	Estimated Person/Months of Consultant Support
	WASTE ACQUISITION		
#1 ▽	• Review tonnage estimates, institute weighing program to collect sample weigh data to set design criteria and RFP Performance Standards.	Engineering Management Legal/Institutional	3-6 (exclusive of weigh and composition programm)
	• Conduct composition sampling to establish waste specification for RFP.		
	• Develop negotiating policies for securing the waste of other jurisdictions.		
#2 ▽	• Conduct negotiations and enter into interlocal agreements.		

ILLUSTRATIVE SCHEDULE OF TASKS

FOR PROJECT IMPLEMENTATION

Milestones	Tasks	Types of Expertise Required	Estimated Person/Months of Consultant Support
	MARKET ARRANGEMENTS		
	• Conduct further technical and economic evaluation of market alternatives to include:	Management Engineering Economic Legal/Institutional	6-9
	- Environmental and technical feasibility of alternative sites; emissions impacts and air quality regulations; and residual disposal constraints.		
	- Review technical performance specifications of alternative buyers.		
	- Evaluate legal/institutional implications of siting alternatives.		
	- Forecast prices of displaced fuels and analyze alternative pricing scenarios.		
	- Develop contract principles for alternative market agreements.		
$\#_3$ ▽	- Enter into negotiations, select preferred market and conclude agreement in principle.		
	TECHNOLOGY ASSESSMENT		
$\#_4$ ▽	• Develop conceptual design of system at level of mass and energy balances and emission loadings.	Engineering	1

ILLUSTRATIVE SCHEDULE OF TASKS

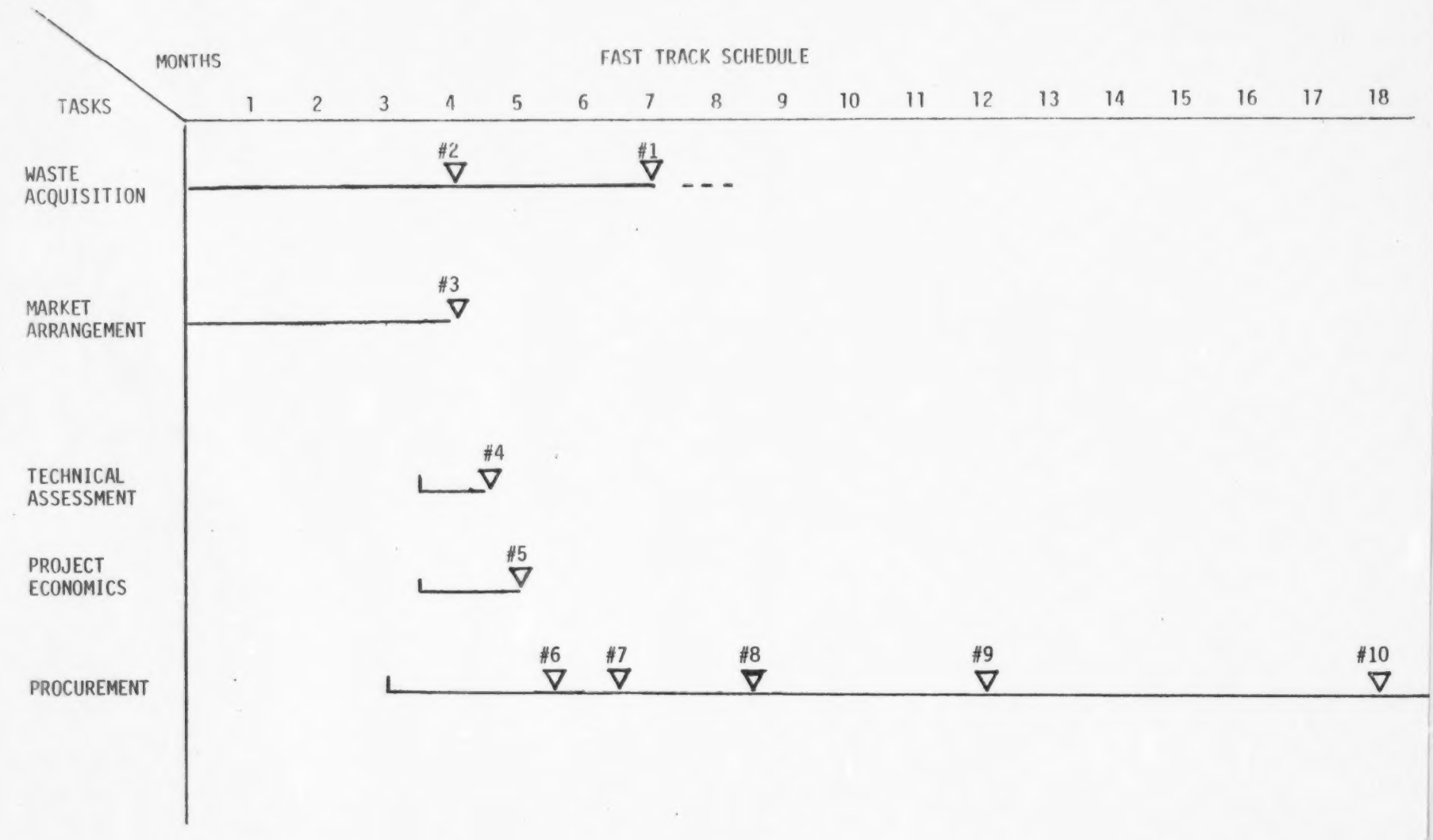
FOR PROJECT IMPLEMENTATION

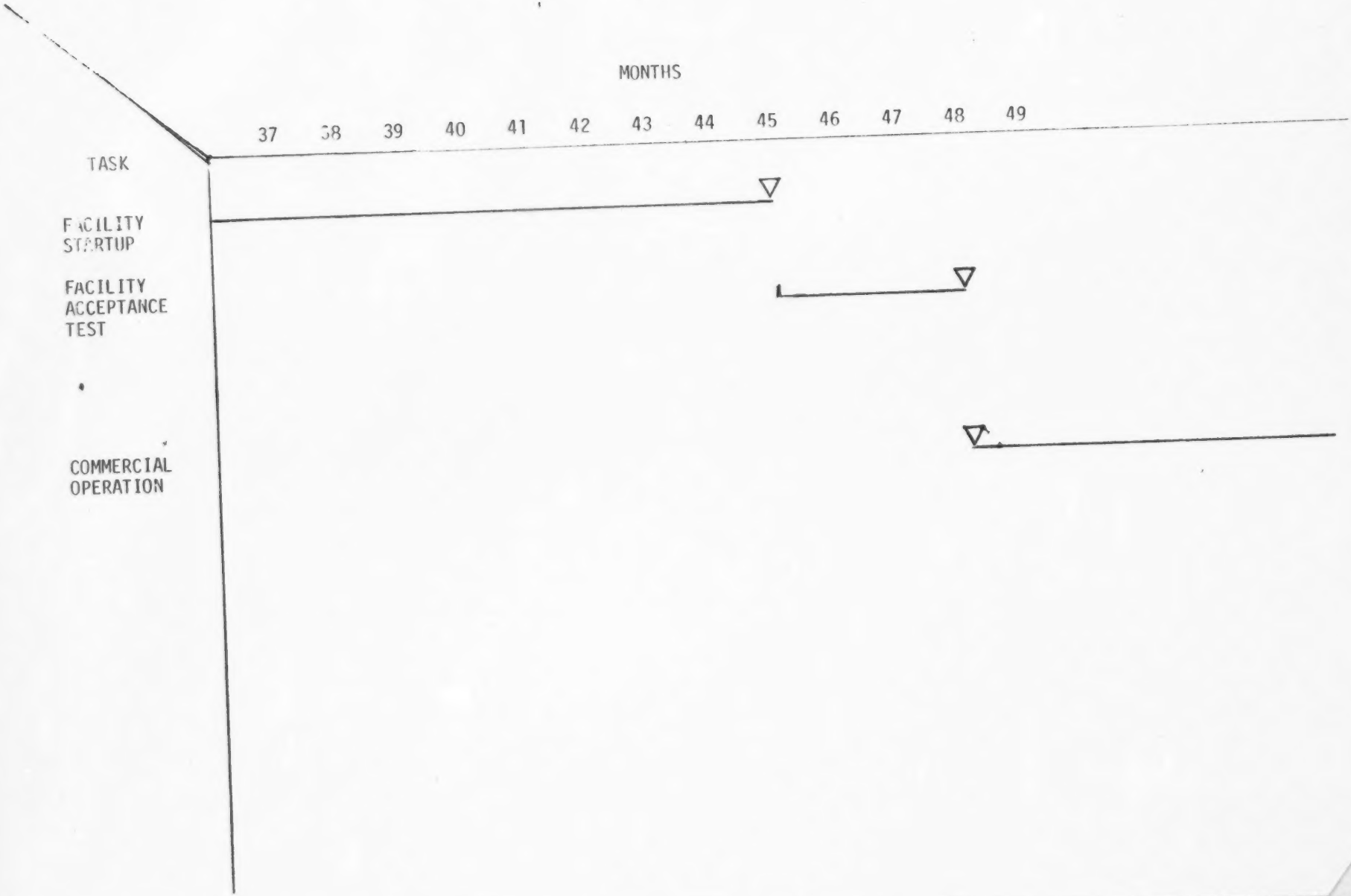
Milestones	Tasks	Types of Expertise Required	Estimated Person/Months of Consultant Support
	PROJECT ECONOMICS		
#5 ∇	• Validate project economics based upon configuration of waste supply, site, market, and technology.	Economic	1
	PROCUREMENT		
	• Review procurement options and risk allocation strategies.	Management Engineering Economic Legal/Institutional	24-30
#6 ∇	• Select procurement approach.		
	• Identify permit requirements.		
#7 ∇	• Develop system performance requirements.		
#8 ∇	• Develop contract principles.		
#9 ∇	• Prepare and issue procurement documents.		
	• Receive responses and evaluate bids.		
#10 ∇	• Select preferred Bidder(s) and enter into negotiations.		
#11 ∇	• Conclude negotiations.		

ILLUSTRATIVE SCHEDULE OF TASKS

FOR PROJECT IMPLEMENTATION

Milestones	Tasks	Types of Expertise Required	Estimated Person/Months of Consultant Support
	CONSTRUCTION		
#12 ▽	• Complete final design.	Management Engineering	3-6
#13 ▽	• Complete construction.		
	FACILITY STARTUP		
#14 ▽	• Complete.	Management/ Engineering	6
	FACILITY ACCEPTANCE TESTING		
#15 ▽	• Complete.	Management/ Engineering	6
	COMMERCIAL OPERATION		
#16 ▽	• Begin.		


MONTHS
FAST TRACK SCHEDULE
TASKS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
WASTE ACQUISITION
#2
#1
MARKET ARRANGEMENT
#3
TECHNICAL ASSESSMENT
#4
PROJECT ECONOMICS
#5
PROCUREMENT
#6
#7
#8
#9
#10


MONTHS
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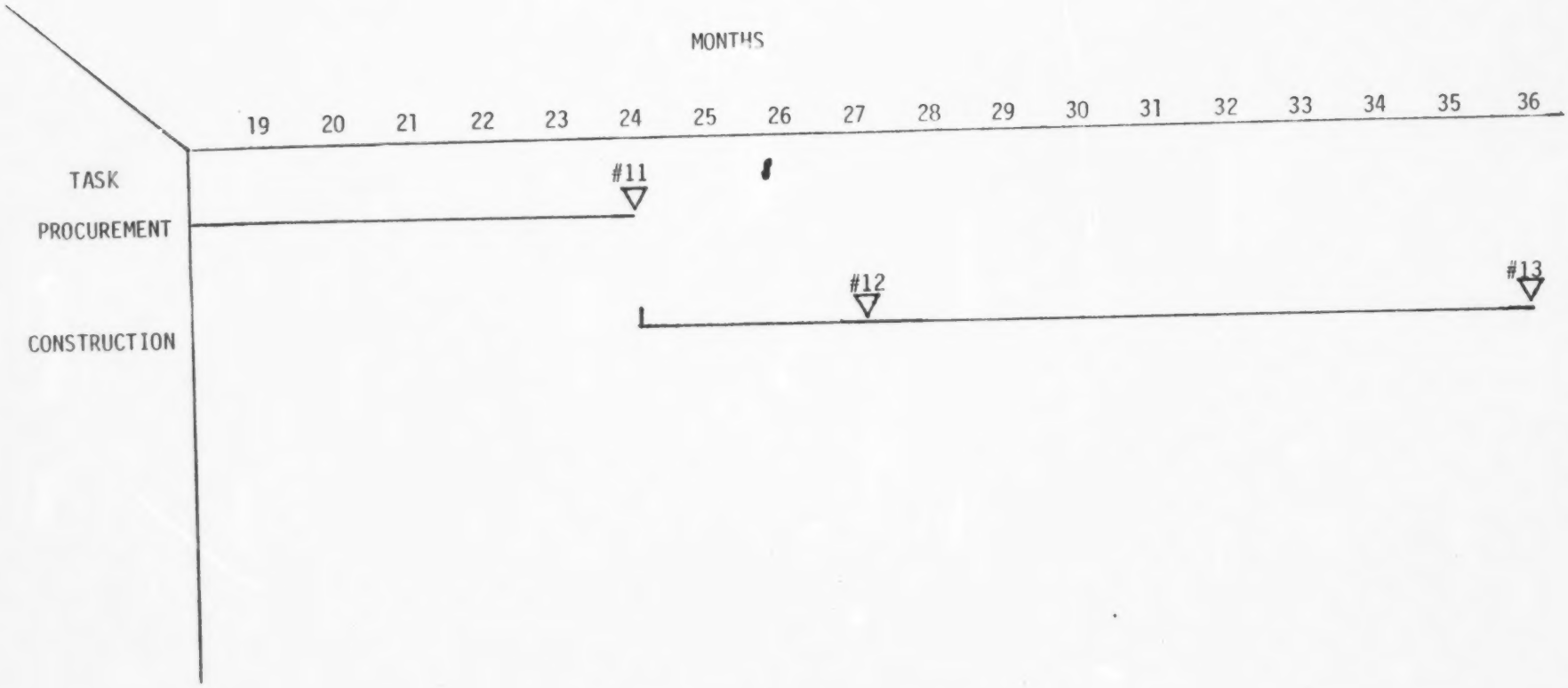
TASK
FACILITY STARTUP
FACILITY ACCEPTANCE TEST
COMMERCIAL OPERATION


MONTHS
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TASK
PROCUREMENT
CONSTRUCTION
#11
#12
#13